



**ENVIRONMENTAL ASSESSMENT  
FOR  
C-17 AND KC-135 RECURRING TRAINING AT  
LAWTON, OKLAHOMA**

**United States Air Force  
Air Education and Training Command  
Altus Air Force Base, Oklahoma**

**May 2004**

<b>Report Documentation Page</b>		<i>Form Approved OMB No. 0704-0188</i>
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## FINDING OF NO SIGNIFICANT IMPACT

### C-17 AND KC-135 RECURRING TRAINING AT LAWTON, OKLAHOMA

#### AGENCY: United States Air Force

**PURPOSE:** The Air Force has prepared an environmental assessment (EA) for the implementation of recurring C-17 and KC-135 training at Lawton/Fort Sill Regional Airport and Henry Post Army Airfield (AAF) in Lawton/Fort Sill, Comanche County, Oklahoma, as described in the next paragraph. This EA has been accomplished pursuant to the National Environmental Policy Act (NEPA); the Council of Environmental Quality regulations implementing the NEPA; Department of Defense (DoD) Directive 6050.1, *Environmental Effects in the United States of DoD Actions*; and Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, which implements these regulations.

**PROPOSED ACTION:** The Air Force is proposing to use the Lawton/Fort Sill Regional Airport and the Henry Post AAF at Fort Sill to alleviate some of the pattern congestion associated with the aircraft training program at Altus Air Force Base (AFB). Under the **proposed action, C-17 students would accomplish one to three daylight missions per week.** Each mission would consist of several maneuvers. The C-17 maneuvers at Lawton/Fort Sill Regional Airport would include four published instrument approaches and four Visual Flight Rules (VFR) patterns for a total of eight “touch-and-go” operations at minimum continuous power. The maneuvers at Henry Post AAF would include six “go-around” operations using maximum power and four full-stop operations using maximum reverse thrust for a total of ten VFR approaches. Additionally, one mission per month at Fort Sill would incorporate cargo load ground training. There would be no construction or demolition activities associated with the proposed action.

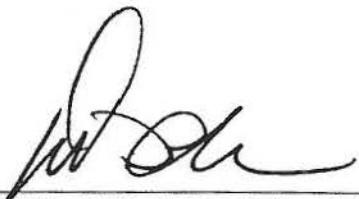
**ONGOING ACTIONS:** Ongoing actions include the bed-down of additional C-17 aircraft at Altus AFB.

**SUMMARY OF FINDINGS:** This EA evaluated the environmental sensitivity of the Lawton/Fort Sill area with regards to the proposed action. Given the limited scope of the proposed action and alternatives, any potential impacts to the environment would be limited to those resource areas directly or indirectly affected by the increase flight and cargo operations. As a result, several resource areas were evaluated and determined not to be of relevance to this environmental analysis and, therefore, not discussed in this document. Those resource areas would include geological and earth resources, water resources, cultural and historical resources, and hazardous materials and wastes. For those resource areas directly affected by the proposed action (e.g., noise and air quality), a thorough assessment and modeling were accomplished in order to define any potential environmental impacts. Other resource areas, such as biological resources and

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**DECISION:** Based on my review of the facts and analysis contained in this environmental assessment, I conclude that the implementation of the proposed action will not produce significant impacts by itself or considering cumulative impacts. Accordingly, the requirements of the National Environmental Policy Act, regulations promulgated by the President's Council on Environmental Quality, and Air Force Instruction 32-7061 are fulfilled and an environmental impact statement is not required.



DAVID R. MILLER, Colonel, USAF  
Chairperson, Environmental Protection Committee  
Altus Air Force Base, Oklahoma

4 Sep 04

Date

**Privacy Advisory for EA**

As part of the request for comments on the Draft Environmental Assessment (EA), letters or other written or oral comments provided may be published in the Final EA. As required by law, comments have been addressed in the Final EA and made available to the public. Any personal information provided has been used only to identify your desire to make a statement during the public comment portion of any public meeting or hearings or to fulfill requests for copies of the Final EA or associated documents. Private addresses have been compiled to develop a mailing list for those requesting copies of the Final EA. However, only the names of the individuals making comments and specific comments have been disclosed. Personal home addresses and phone numbers have not been published in the Final EA

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## FINDING OF NO SIGNIFICANT IMPACT

### C-17 AND KC-135 RECURRING TRAINING AT LAWTON, OKLAHOMA

**AGENCY:** United States Air Force

**PURPOSE:** The Air Force has prepared an environmental assessment (EA) for the implementation of recurring C-17 and KC-135 training at Lawton/Fort Sill Regional Airport and Henry Post Army Airfield (AAF) in Lawton/Fort Sill, Comanche County, Oklahoma, as described in the next paragraph. This EA has been accomplished pursuant to the National Environmental Policy Act (NEPA); the Council of Environmental Quality regulations implementing the NEPA; Department of Defense (DoD) Directive 6050.1, *Environmental Effects in the United States of DoD Actions*; and Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, which implements these regulations.

**PROPOSED ACTION:** The Air Force is proposing to use the Lawton/Fort Sill Regional Airport and the Henry Post AAF at Fort Sill to alleviate some of the pattern congestion associated with the aircraft training program at Altus Air Force Base (AFB). Under the **proposed action, C-17 students would accomplish one to three daylight missions per week.** Each mission would consist of several maneuvers. The C-17 maneuvers at Lawton/Fort Sill Regional Airport would include four published instrument approaches and four Visual Flight Rules (VFR) patterns for a total of eight “touch-and-go” operations at minimum continuous power. The maneuvers at Henry Post AAF would include six “go-around” operations using maximum power and four full-stop operations using maximum reverse thrust for a total of ten VFR approaches. Additionally, one mission per month at Fort Sill would incorporate cargo load ground training. There would be no construction or demolition activities associated with the proposed action.

**ONGOING ACTIONS:** Ongoing actions include the bed-down of additional C-17 aircraft at Altus AFB.

**SUMMARY OF FINDINGS:** This EA evaluated the environmental sensitivity of the Lawton/Fort Sill area with regards to the proposed action. Given the limited scope of the proposed action and alternatives, any potential impacts to the environment would be limited to those resource areas directly or indirectly affected by the increase flight and cargo operations. As a result, several resource areas were evaluated and determined not to be of relevance to this environmental analysis and, therefore, not discussed in this document. Those resource areas would include geological and earth resources, water resources, cultural and historical resources, and hazardous materials and wastes. For those resource areas directly affected by the proposed action (e.g., noise and air quality), a thorough assessment and modeling were accomplished in order to define any potential environmental impacts. Other resource areas, such as biological resources and

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socioeconomic/environmental justice, were assessed and discussed only to the level commensurate to the potential for impact.

**Noise.** The increase flight operations at Lawton/Fort Sill Regional Airport and Henry Post AAF would result in a small to moderate increase in the area of land surrounding the two airfields that would be exposed to 65 dBA or greater noise levels, 5 and 36 percent respectively. As a result, there would be a small increase of 23 percent for Lawton/Fort Sill Regional Airport and 39 percent for Henry Post AAF. These increases would equate to approximately 214 additional people at Lawton/Fort Sill Regional Airport and 107 additional people at Henry Post AAF exposed to 65 dBA or greater noise levels.

**Air Quality.** Emissions of all pollutants will be less than 250 tons per year; therefore, the proposed action will not be considered regionally significant. The estimated emissions from the proposed aircraft operations would account for less than 2.5 percent of the total regional (Air Quality Control Region 189) stationary source emissions for each pollutant. Therefore, emissions from the proposed action would not result in any long-term impacts on the air quality of Comanche County and would not affect visibility at the Wichita Mountains Wildlife Refuge Class I area.

**Biological Resources.** The proposed action would occur within the urban-developed area of Lawton/Fort Sill, Oklahoma. There would be no change in the military training routes currently used at both the Lawton/Fort Sill Regional Airport and the Henry Post AAF. The proposed increases in the flight activities at both airfields would not pose a significant impact to the existing or regional movement of any protected species that could be present in the area. Additionally, the proposed action would not significantly degrade or modify any critical habitat.

**Environmental Justice.** Of the estimated 214 additional people that would be affected by the increase flight operations and associated noise levels at Lawton/Fort Sill Regional, the percentage of minority and low-income individuals would be less than the percentage for Comanche County. Of the estimated 107 additional people that would be affected by the increase flight operations and associated noise levels at Henry Post AAF, the percentage of minority and low-income individuals would be equal to or slightly higher than the percentage for Comanche County. Therefore, the proposed action would not represent a disproportionate high number of minorities or low-income families impacted by the increase in population exposed to 65 dBA noise levels or greater at Lawton/Fort Sill Regional Airport or Henry Post AAF.

**ALTERNATIVE ACTION:** No viable alternative actions were identified or evaluated as part of this effort.

**NO-ACTION ALTERNATIVE:** There would be no change in the flight operations at either the Lawton/Fort Sill Regional Airport or Henry Post AAF. Additionally, no additional cargo load training would occur at the Henry Post AAF. No significant environmental impacts would be associated with the continue operations at either airfield. Therefore, no significant impacts would be expected for the no-action alternative.

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**DECISION:** Based on my review of the facts and analysis contained in this environmental assessment, I conclude that the implementation of the proposed action will not produce significant impacts by itself or considering cumulative impacts. Accordingly, the requirements of the National Environmental Policy Act, regulations promulgated by the President's Council on Environmental Quality, and Air Force Instruction 32-7061 are fulfilled and an environmental impact statement is not required.

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**DAVID R. MILLER, Colonel, USAF**  
**Chairperson, Environmental Process Committee**  
**Altus Air Force Base, Oklahoma**

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**Date**

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## **Environmental Assessment**

### **C-17 and KC-135 Recurring Training at Lawton, Oklahoma**

**Department of the Air Force  
97<sup>th</sup> Air Mobility Wing  
Altus Air Force Base, Oklahoma**

**May 2004**



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## COVER SHEET

**Responsible Agency:** Altus Air Force Base (AFB), Oklahoma.

**Proposed Action:** C-17 and KC-135 Recurring Training at Lawton, Oklahoma.

**Proposed Location:** Lawton/Fort Sill, Comanche County, Oklahoma

**Point of Contact:** 97 CES/CEV, 401 L Avenue, Altus AFB, Oklahoma, 73523-5138, 580.481.7606.

**Report Designation:** Preliminary Draft Environmental Assessment (EA)

**Abstract:** The purpose of the proposed action is to implement recurring C-17 and K-135 training at the Lawton/Fort Sill Regional Airport and the Henry Post AAF. Currently, the pattern congestion around Altus AFB is impacting the effectiveness of the training program at the base. This congestion will continue to increase as additional C-17 aircraft are added to the current inventory. Under the proposed action, C-17 students would accomplish one to three daylight missions per week. Each mission would consist of several maneuvers. The C-17 maneuvers at Lawton/Fort Sill Regional Airport would include four published instrument approaches and four Visual Flight Rules (VFR) patterns for a total of eight “touch-and-go” operations at minimum continuous power. The maneuvers at Henry Post AAF would include six “go-around” operations using maximum power and four full-stop operations using maximum reverse thrust for a total of ten VFR approaches. Additionally, one mission per month at Fort Sill would incorporate cargo load ground training. There would be no construction or demolition activities associated with the proposed action.

No viable alternatives to the proposed action, other than the no-action alternative, were identified or evaluated as part of this analysis. Under the no-action alternative there would be no change in the current flight operations at either the Lawton/Fort Sill Regional Airport or the Henry Post AAF. As a result there would be no change to the physical environments associated with either airfield.

The subsequent Environmental Assessment for this effort will evaluate the potential environmental impacts that would be associated with the proposed action and no-action alternative. Resources that will be considered in the analysis are: noise, air quality, biological resources, and socioeconomic/environmental justice. The Draft Environmental Assessment will be made available to the public for review and comment.

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- D Noise Analysis and Methodology
- E Aircraft Operations and Noise Data Package for Lawton/Fort Sill Regional Airport and Henry Post AAF

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**ACRONYMS AND ABBREVIATIONS**

$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
AAF	Army Air Field
AETC	Air Education and Training Command
AFB	Air Force Base
AFI	Air Force Instruction
AGL	above ground level
ALZ	Assault Landing Zone
AMC	Air Mobility Command
AMW	Air Mobility Wing
AQCR	air quality control region
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
dB	decibel
dBA	A-weighted decibels
DoD	Department of Defense
DOT	Department of Transportation
EA	environmental assessment
EIAP	environmental impact analysis process
EIS	Environmental Impact Statement
EO	Executive Order
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
HUD	Department of Housing and Urban Development
Hz	hertz
IFR	Instrument Flight Rules
IR	IFR routes
$L_{dn}$	Day-Night Average Sound Level
$L_{max}$	maximum sound level

**ACRONYMS AND ABBREVIATIONS (cont.)**

MAC	Military Airlifts Command
MAW	Military Airlift Wing
mph	miles per hour
MSL	mean sea level
MTR	military training routes
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO <sub>X</sub>	nitrogen oxides
O <sub>3</sub>	ozone
ODEQ	Oklahoma Department of Environmental Quality
OSHA	Occupational Safety and Health Administration
PM <sub>10</sub>	less than 10 microns in diameter
PM <sub>2.5</sub>	less than 2.5 microns in diameter
ppm	parts per million
PSD	Prevention of significant deteriation
ROI	region of influence
SAC	Strategic Air Command
SEL	Sound Exposure Level
SIP	State Implementation Plan
SO <sub>X</sub>	sulfur oxides
SR	slow routes
tpy	tons per year
TRADOC	US Army Training and Doctrine Command
USC	United States Code
USEPA	US Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VA	Veterans Administration
VFR	Visual Flight Rules
VOC	volatile organic compounds
VR	VFR routes

## **CHAPTER 1**

### **PURPOSE OF AND NEED FOR THE PROPOSED ACTION**

This chapter has three sections: a statement of the purpose of and need for the proposed action, a description of the location of the proposed action, and a description of the scope of the environmental review.

#### **1.1 PURPOSE OF AND NEED FOR ACTION**

Altus Air Force Base (AFB), Oklahoma, an Air Education and Training Command (AETC) installation, is the home of the 97<sup>th</sup> Air Mobility Wing (AMW). Altus AFB consists of 6,600 acres and lies in Township 2 North, Range 20 West. Altus AFB is located within the city limits of Altus, Oklahoma, on the northeast side of the city. Altus, Oklahoma is the county seat of Jackson County.

The 97<sup>th</sup> AMW's mission is to conduct AETC's formal strategic airlift and aerial refueling flying training programs, to maintain and support C-5, C-17, and KC-135 aircraft, and to serve as the aerial port of embarkation for the Army at Fort Sill, Oklahoma. Altus AFB is the Air Force's only Air Mobility Training Center for pilots, navigators, flight engineers, loadmasters, and boom operators. In addition to its training mission, the 97<sup>th</sup> AMW has approximately 333 training instructors who are combat-ready aircrew members and prepared, when needed, for world-wide deployment.

The Air Force proposes to implement C-17 and KC-135 recurring training at both the Lawton/Fort Sill Regional Airport, Lawton, Oklahoma and the Henry Post Army Airfield (AAF) at Fort Sill, Oklahoma. These two additional airfields would support the current C-17 and KC-135 training programs by providing students with varying training scenarios at less familiar airfields and would relieve some of the airspace congestion at Altus AFB.

Currently, the pattern congestion around Altus AFB is impacting the effectiveness of the training program at the base. This congestion will continue to increase as additional C-17 aircraft are added to the current inventory at Altus AFB. As a result, alternative airfields were identified and evaluated as a means to alleviate the situation. A minor component of the KC-135 aircraft training operation was also included in this assessment to further alleviate the pattern congestion at Altus AFB. Lawton/Fort Sill Regional Airport would provide an area for instrument approach and Visual Flight Rules (VFR) touch and go training, and the Henry Post AAF would provide an area for assault zone training and ground operations.

## **1.2 LOCATION**

The city of Lawton is located in the southwestern portion of Oklahoma in Comanche County. Lawton (Lawton/Fort Sill as it is sometimes referred to) is located approximately 90 miles southeast of Oklahoma City, Oklahoma, and 55 miles west of Altus AFB, Altus, Oklahoma. Figure 1-1 shows the regional location of Lawton/Fort Sill.

There are two airfields located in the vicinity of Lawton/Fort Sill: 1) the Lawton/Fort Sill Regional Airport; and 2) the Henry Post AAF. Both of these airfields have been identified by the Air Force as possible locations to support additional C-17 and KC-135 aircraft training for Altus AFB. The Lawton/Fort Sill Regional Airport is located in the southern portion of the city, and the Henry Post AAF is located just north of the city on Fort Sill (Figure 1-2).

## **1.3 SCOPE OF THE ENVIRONMENTAL REVIEW**

The *National Environmental Policy Act* (NEPA) of 1969, as amended, requires federal agencies to consider environmental consequences in the decision-making process. The President's Council on Environmental Quality (CEQ) issued regulations to implement NEPA that include provisions for both the content and procedural aspects of the required environmental assessment (EA). The Air Force Environmental Impact Analysis Process (EIAP) is accomplished through adherence to the procedures set forth in CEQ regulations (40 Code of Federal Regulations [CFR] Sections 1500-1508) and 32 CFR 989 (Air Force Environmental Impact Analysis Process), 15 July 1999, and amended 28 March 2001. These federal regulations establish both the administrative process and substantive scope of the environmental impact evaluation designed to ensure that deciding authorities have a proper understanding of the potential environmental consequences of a contemplated course of action. The CEQ regulations require that an EA:

- Briefly provide evidence and analysis to determine whether the proposed action might have significant effects that would require preparation of an environmental impact statement (EIS). If analysis determines that the environmental effects would not be significant, a finding of no significant impact (FONSI) will be prepared; or
- Facilitate the preparation of an EIS, when required.

This EA identifies, describes, and evaluates the potential environmental impacts that could result from the implementation of the proposed projects while taking into consideration possible cumulative impacts from other actions planned for Lawton/Fort Sill Regional Airport, the Henry Post AAF at Fort Sill, and Altus AFB.

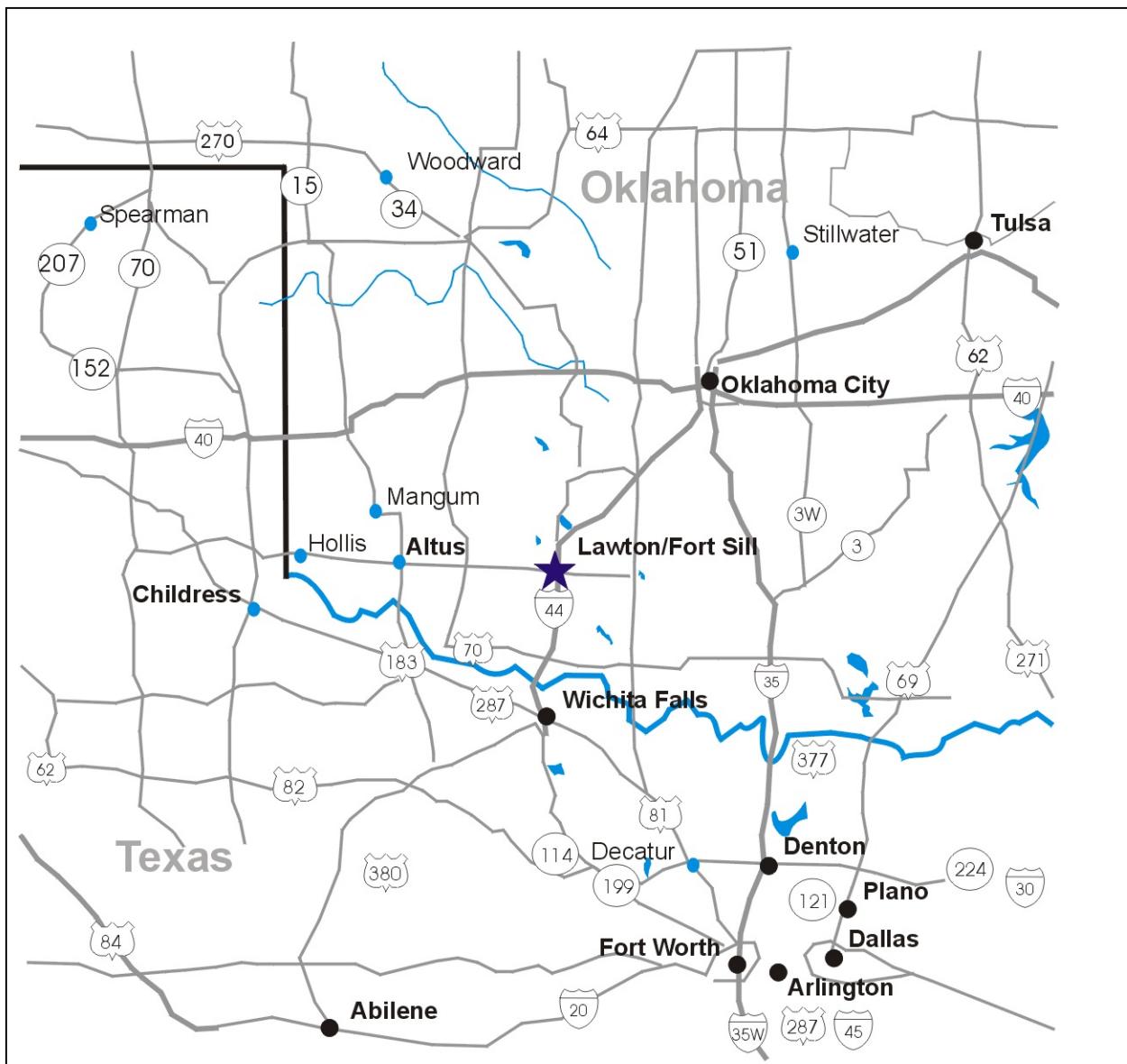
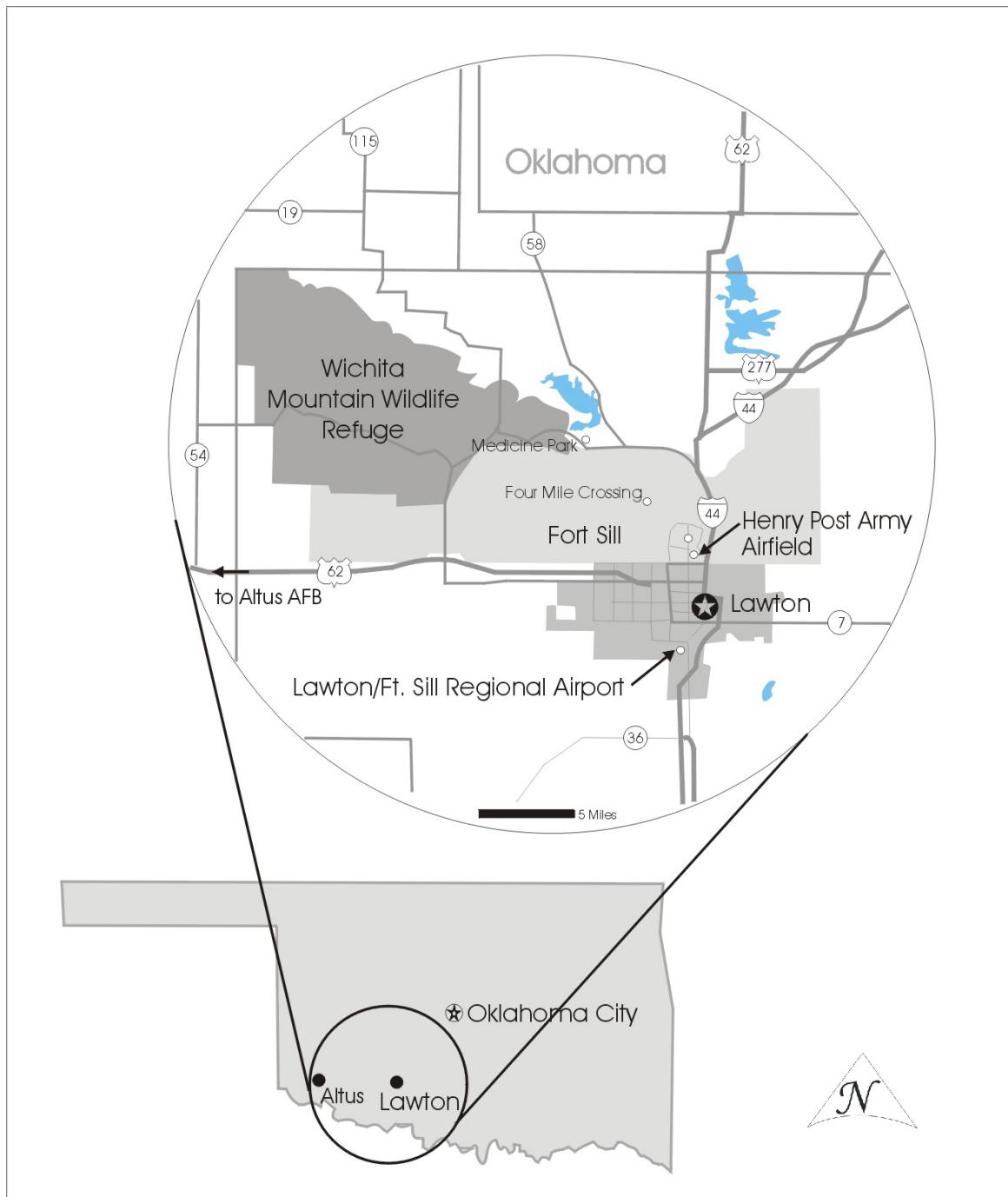


Figure 1-1 Location Map, Lawton/Fort Sill, Oklahoma



**Figure 1-2 Regional Location Map, Lawton/Fort Sill and Altus Air Force Base, Oklahoma**

This EA also identifies required environmental permits relevant to the proposed action and alternative actions. As appropriate, the affected environment and environmental consequences of the action may be described in terms of a regional overview or a site-specific description. Finally, although mitigation measures are not required as part of this effort, the EA identifies actions that could be taken to further minimize environmental impacts.

The following biophysical (combined biological and physical) resources were identified for study at Lawton, Fort Sill, and Altus AFB: noise, air quality, earth resources, water resources, infrastructure and utilities, hazardous materials and wastes, biological resources, cultural resources, socioeconomic resources, and land use. Assessment of safety and health impacts is not included in this document, because all contractors would be responsible for compliance with applicable Occupational Safety and Health Act (OSHA) regulations concerning occupational hazards and for specifying appropriate protective measures for their employees. In addition, aircraft operations and maintenance activities, which would be subject to OSHA regulations, are not components of the proposed action.

The affected environment as presented in this C-17 and KC-135 Recurring Training EA will be used to establish the baseline conditions. For analysis purposes, fiscal year 2003 will be assessed to represent the potential annual economic impacts at Lawton, Fort Sill, and Altus AFB for the duration of the proposed or alternative actions.

The Air Force has announced other actions for Altus AFB concurrent with the proposed action. Additionally, there is a potential for other projects to be implemented at both Lawton/Fort Sill Regional Airport and at the Henry Post AAF. The environmental impacts of these other actions have been analyzed through the EIAP and are addressed in this EA only in the context of potential cumulative impacts if any. A cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

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## **CHAPTER 2**

### **DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES**

#### **2.1 INTRODUCTION**

This chapter is composed of seven sections: an introduction, a brief history of the formulation of alternatives to the proposed action, identification of alternatives eliminated from further consideration, a detailed description of the proposed action, a description of the no-action alternative, a detailed description of other action alternatives, and a cumulative impacts analysis.

#### **2.2 HISTORY OF THE FORMULATION OF ALTERNATIVES**

##### **2.2.1 Alternative Selection Criteria**

The factors considered when developing the proposed action and alternatives for this EA were based on the potential impacts of C-17 recurring training at Lawton/Fort Sill Regional Airport and the Henry Post AAF. As stated in Chapter 1, the main focus of the Proposed Action would be to alleviate the current pattern congestion at Altus AFB by accomplishing some of the C-17 and KC-135 aircraft training operations at Lawton/Fort Sill Regional Airport and the Henry Post AAF. This section outlines the selection criteria used to identify alternatives.

The airspace associated with Altus AFB is saturated by current aircraft training and other mission support operations. The airfield configuration at Altus AFB consists of two parallel runways with an Assault Landing Zone (ALZ) in between them. Due to the close proximity of the ALZ and eastern runway, simultaneous operations are not possible, thus compounding pattern saturation. Aircraft and airspace pattern congestion can decrease the effectiveness of aircrew training at the installation. By shifting some of the C-17 and KC-135 aircraft training to Lawton/Fort Sill Regional Airport and Henry Post AAF, the Altus AFB runway activity would decrease. This decrease in runway activity would allow for increase training on the ALZ strip at Altus AFB. The options facing the Air Force were to continue under the current conditions and decrease training program efficiencies, reduce the number of training operations, thereby negatively impacting the training mission, or find alternative, suitable locations that could accept additional C-17 and KC-135 aircraft training operations. Impacts to the training mission were key considerations during the criteria development phase. Altus AFB students must accomplish all syllabus-training requirements in order to graduate. The typical training sortie has evolved into a highly efficient activity in which training events occur in rapid succession in order to meet program goals.

To evaluate alternative locations, the Air Force defined the minimum facility, airspace, and cargo deployment requirements necessary to support the C-17 and KC-135 training operations. Airspace availability was a major component in the identification of the alternative locations, as was airfield specifications, range and routes available for increased use, and compatible area land use. All candidate locations would have to have the infrastructure already in place to support C-17 and KC-135 operations. No new construction would be accomplished under the Proposed Action. The airfield required for C-17 ALZ training needed to have a short runway between 3,500 and 5,000 feet long by 90 to 100-feet wide. Some C-17 ALZ training could be accomplished on larger, non-Federal Aviation Administration (FAA) runways with markings that simulate such an assault landing strip (i.e., a runway 5,000 feet by 200 feet could be marked with lines of dimensions 3,500 feet by 100 feet). Additionally, some C-17 events and all KC-135 events require a runway greater than 7,000 feet long for touch-and-go training.

The selection of the candidate locations and the implementation of the program at the site would also need to minimize any disruption to the training program and allow the maximum number of training events to occur during each sortie.

### **2.2.2 Development of the Proposed Action and Alternatives**

The development of the Proposed Action and its alternatives consolidated many complex elements and considered many reasonable options. The elements that defined the proposed action and its alternatives are discussed in detail in the following sections. The proposed action and the no-action alternative defined in this EA are described in detail in Sections 2.4 and 2.5, respectively.

As detailed in Section 1.1, the congested airspace at Altus AFB is impacting the effectiveness of the C-17 aircraft training program. By not resolving the issues at hand, the training mission at Altus AFB would decline, thus impacting the installation's ability to meet mission objectives set by the Air Force. Reducing the number of training operations to alleviate some of the pattern congestion would also negatively impact the installation's ability to meet training mission requirements. More specifically, if C-17 training is not provided at the proposed locations, students likely will not accomplish all required training, and the flying squadrons gaining the students after graduation would be receiving pilots with a lower than desired ability level. This condition would force the gaining squadrons to conduct unanticipated training to raise pilots' proficiency to the desired level, thereby placing a strain on the squadron's flying program and operational capability. As a result, Altus AFB personnel began identifying and evaluating alternative airfields that could support some of the C-17 and KC-135 aircraft training operations.

### **2.3 IDENTIFICATION OF ALTERNATIVES ELIMINATED FROM CONSIDERATION**

Once the selection criteria for the C-17 and KC-135 training programs were defined by program officials, military airfields in the vicinity of Altus AFB were evaluated. No additional sites could be identified for consideration other than the proposed sites

(Henry Post AAF and Lawton/Fort Sill Regional Airport). The Henry Post AAF provides a unique combination of airspace and airfield resources, as well as cargo deployment capabilities for advanced training. Lawton/Fort Sill Regional Airport is conveniently located near the Henry Post AAF to support the longer runway requirements of both the KC-135 and C-17 aircraft. As a result, no alternatives for the Proposed Action were considered other than the No-action Alternative.

## **2.4 DETAILED DESCRIPTION OF THE PROPOSED ACTION**

The Air Force is proposing to use the Lawton/Fort Sill Regional Airport and the Henry Post AAF to alleviate some of the pattern congestion associated with the aircraft training program at Altus AFB. Under the proposed action, C-17 students would accomplish one to three daylight missions per week. Missions would be accomplished using existing military training routes (MTRs). There are three types of MTRs. Routes flown using Instrument Flight Rules (IFR) procedures (IR routes) allow aircraft to operate below 10,000 feet above mean sea level (MSL) at speeds in excess of 250 knots (288 mph) along Department of Defense (DoD)/FAA mutually developed and published routes in IFR conditions. Routes flown using VFR procedures (VR routes) are guided by the same restrictions as IR routes but are limited to VFR conditions. The meteorological conditions required to fly VR routes are a 3,000-foot ceiling (cloud cover) and 5 miles visibility. Slow Routes (SR) are slow speed low altitude training routes that operate below 1,500 feet above ground level (AGL) at airspeeds of 250 knots or less. Aircraft operations on SRs are not included in the proposed action. Each mission would consist of several maneuvers. Those maneuvers would be accomplished at both Lawton/Fort Sill Regional Airport and Henry Post AAF. The C-17 maneuvers at Lawton/Fort Sill Regional Airport would include four (4) published instrument approaches and four (4) VFR patterns for a total of eight (8) "touch and go" operations at minimum continuous power. The maneuvers at Henry Post AAF would include six (6) "go-around" operations using maximum power and four (4) full-stop operations using maximum reverse thrust for a total of ten (10) VFR approaches. Additionally, one (1) mission per month at Fort Sill would incorporate cargo load ground training.

Additionally, under the Proposed Action to further reduce airspace/pattern congestion, the Air Force is proposing to conduct one (1) KC-135 training mission per day, five (5) days per week at Lawton/Fort Sill Regional Airport and Henry Post AAF. Under this training mission the Air Force pilots would fly several maneuvers to Lawton/Fort Sill Regional Airport and the Henry Post AAF. The maneuvers would consist of 1½ hours of IFR patterns with six (6) approaches split equally between the Henry Post AAF and Lawton/Fort Sill Regional Airport; and one (1) hour of VFR closed pattern with eight (8) approaches to Lawton/Fort Sill Regional Airport.

In order to accomplish the proposed training at Henry Post AAF, the Air Force (97<sup>th</sup> AMW) would enter into a memo of agreement with the Henry Post AAF operations manager. This letter of agreement would allow for the painting of assault landing zone markings on the Fort Sill runway and would limit Air Force maintenance liability as a result of the increase in heavy aircraft operations. It would further address the increased training to be accomplished at both the Henry Post AAF and Lawton/Fort Sill Regional Airport.

## **2.5 DESCRIPTION OF THE NO-ACTION ALTERNATIVE**

Under the No-Action Alternative, Altus AFB would not implement any of the actions defined in Section 2.4. Without the alternative airfields at Lawton/Fort Sill Regional Airport and the Henry Post AAF, pattern congestion would continue to degrade the quality of C-17 aircrew training program at Altus AFB. This degradation would, in turn, impact the overall readiness of the C-17 program for the Air Force.

## **2.6 DETAILED DESCRIPTION OF OTHER ACTION ALTERNATIVES**

As discussed in Sections 2.2.2 and 2.3 of this document, no additional sites or alternatives for the proposed action were identified during the preliminary evaluation and development of this effort. Therefore, only the proposed action and no-action alternatives for the C-17 and KC-135 recurring training at Lawton/Fort Sill Regional Airport and Henry Post AAF were evaluated for this effort.

## **2.7 CONSIDERATION OF PAST, PRESENT, AND FORESEEABLE ACTIONS**

A cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” In addition to the proposed action, the Air Force has announced other proposed actions affecting Altus AFB during the same time period as the proposed projects. Additional bed-down of C-17 Aircraft at Altus AFB (active NEPA evaluation and documentation pending September 2003) was addressed in separate NEPA documents.

These actions are not directly related to the proposed action evaluated in this EA but are additional actions identified by the installation. The environmental impacts of these additional actions have been or are currently being analyzed in separate NEPA documents. This EA addresses the environmental impacts of these other actions only in the context of potential cumulative impacts if any.

1

**Table 2-1 Summary of Environmental Effects**

<b>Resource</b>	<b>Proposed Action</b>	<b>No-action Alternative</b>
Noise	Small to moderate increase in the area of land exposed to 65 dBA or greater noise levels (5 percent at Lawton/Fort Sill Regional Airport and 36 percent at Henry Post AAF). Additionally, there would be a small increase in the number of individuals exposed to 65 dBA or greater noise levels (an estimated 214 at Lawton/Fort Sill Regional Airport and an estimated 107 percent at Henry Post AAF).	Same as for baseline conditions as presented in Section 3.3.1.
Air Quality	Emissions of all pollutants would be less than 250 tons per year (tpy); therefore, the proposed action would not be considered regionally significant. The estimated emissions from the proposed aircraft operations would account for less than 2.5 percent of the total regional (Air Quality Control Region 189) stationary source emissions for each pollutant.	Same as for baseline conditions as presented in Section 3.3.2.
Biological Resources	The proposed increases in the flight activities at both airfields would not pose a significant impact to the existing or regional movement of any protected species that could be present in the area. Additionally, the proposed action would not significantly degrade or modify any critical habitat.	Same as for baseline conditions as presented in Section 3.3.3.
Environmental Justice	The proportion of minorities and low-income individuals that would be exposed to noise levels of 65 dBA or greater would be lower, equal to, or slightly higher than those proportions for all of Comanche County Oklahoma. Therefore, the proposed action would not represent a disproportionate high number of minorities or low-income families impacted by the increase in population exposed to 65 dBA noise levels or greater at Lawton/Fort Sill Regional Airport or Henry Post AAF.	Same as for baseline conditions as presented in Section 3.3.4.

2

**1      2.8 COMPARISON MATRIX OF ENVIRONMENTAL EFFECTS OF ALL ALTERNATIVES**

**2**      Table 2-1 summarizes the impacts of the proposed and alternative actions. No  
**3** significant impacts are expected from either the proposed or alternative actions. The  
**4** impacts for the no-action alternative are the same as baseline conditions.

**5      2.9 MITIGATION**

**6**      Mitigation measures would not be required for the implementation of the  
**7** proposed action. Although mitigation measures are not required, the EA identifies actions  
**8** that could be taken to minimize environmental impacts that are detailed in Chapter 4  
**9** when applicable.

## CHAPTER 3

### AFFECTED ENVIRONMENT

The affected environment is the baseline against which potential impacts caused by the proposed action are assessed. This chapter focuses on the human environment that has the potential to be affected by the proposed C-17 and KC-135 recurring training at Lawton/Fort Sill Regional Airport and the Henry Post AAF. As stated in 40 CFR §1508.14, the human environment potentially affected is interpreted comprehensively to include the natural and physical resources and the relationship of people with those resources. The approach to defining the environmental baseline was to first identify potential issues and concerns of the proposed action, as discussed in Section 4.0. From this information, the relevant resources are described.

Under the proposed action and alternatives there would be no new construction or modifications of existing facilities at either the Fort Sill/Henry Post AAF or Lawton/Fort Sill Regional Airport. As a result, any potential impacts to the physical environment would be limited to those resource areas directly or indirectly affected by the increase flights and cargo load training. Given the scope of the proposed action and alternatives, several resource areas were evaluated and determined not to be of relevance to this environmental analysis and, therefore, not discussed in this document. Those resource areas would include geological and earth resources, water resources, cultural and historical resources, and hazardous materials and wastes. Other resource areas such as biological resources and socioeconomic resources were assessed and discussed only to the level commensurate to the potential for impact.

The Lawton/Fort Sill Regional Airport and Henry Post AAF are located approximately 55 and 53 miles to the east of Altus AFB, respectively. The Lawton/Fort Sill Regional Airport is located in the south central portion of Lawton, Oklahoma, while Fort Sill is located adjacent to the northern boundary of the city. The two airfields are located within two to three miles of each other. Training operations and support activities occurring on Altus AFB would continue as usual; no changes to on-base activities are proposed. Therefore, this EA will focus on the affected environment in the vicinity of the proposed C-17 and KC-135 recurring training operations at the Lawton/Fort Sill Regional Airport and the Henry Post AAF.

#### 3.1 INTRODUCTION

This chapter provides baseline data for the man-made and natural environmental elements that could potentially be affected by the proposed action and alternatives.

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Information is presented in this section to the level of detail necessary to support the analysis of potential impacts in Chapter 4, Environmental Consequences.

### **3.2 INSTALLATION LOCATION, HISTORY, AND CURRENT MISSION**

#### **3.2.1 Altus AFB**

Altus AFB is located in Jackson County in southwestern Oklahoma, approximately 140 miles southwest of Oklahoma City, Oklahoma, and 50 miles west of Lawton, Oklahoma. Altus AFB, consisting of approximately 3,875 acres, is located on the eastern edge of the City of Altus, Oklahoma.

The evolution of Altus AFB began during World War II when the base was established by the War Department on 17 June 1942. Designated as Altus Army Air Field, the installation served as an advanced flying training school for twin engine aircraft during the war. In May 1945, the US Army deactivated the base. In September 1948, the War Assets Department turned over the installation to the City of Altus and it became the Altus Municipal Airport. In January 1953, the base was reactivated and eventually placed under the Strategic Air Command (SAC) which assumed full control in June 1954. SAC flew B-47s and KC-97s until 1958 when they were replaced by B-52s and KC-135s (USAF 1993).

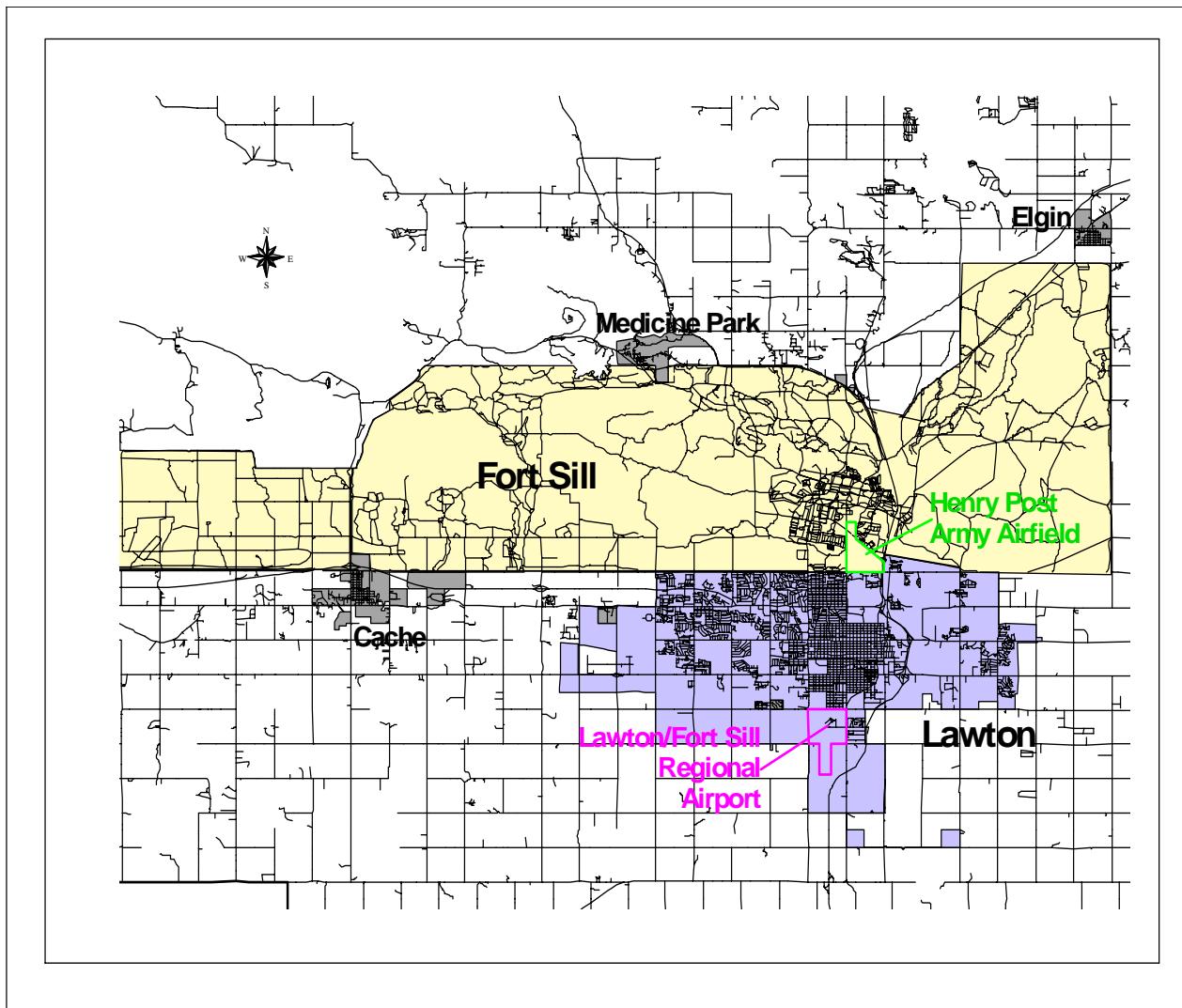
In July 1968, control of Altus AFB was transferred to the Military Airlift Command (MAC). The KC-135s continued their air-refueling mission through tenant organizations at the base. In May 1969, MAC transferred the 433<sup>rd</sup> Military Airlift Wing (433 MAW) from Tinker AFB, Oklahoma, to Altus AFB. The 433 MAW's mission was to train C-141 and C-5 crews. MAC was redesignated as the Air Mobility Command (AMC) in June 1992. The 443 MAW and the 340<sup>th</sup> Air Refueling Wing merged to form the 97 AMW and was incorporated into AMC. On 1 July 1993, the 97 AMW was realigned under AETC, with responsibility for formal aircrew training in C-5, C-141, and KC-135 aircraft (USAF 1993).

The 97 AMW's mission is to operate AETC's strategic airlift and aerial refueling flying training schools, to provide airlift and air refueling support for the Joint Chiefs of Staff Single Integrated Operations Plans, to maintain and support C-5, KC-135, and C-17 aircraft, and to serve as the aerial port of embarkation for the US Army at Fort Sill, Oklahoma (USAF 1993).

#### **3.2.2 Lawton, Oklahoma**

Lawton/Fort Sill, Oklahoma is located in Comanche County, approximately 90 miles southwest of Oklahoma City, Oklahoma and 50 miles north of Wichita Falls, Texas. The Lawton/Fort Sill Regional Airport is located in the southern portion of the city of Lawton, Oklahoma (Figure 3-1). The area surrounding the regional airport is a mixture of commercial, light industrial, and agricultural/undeveloped land use with some residential neighborhoods interspersed throughout the area. The Lawton/Fort Sill Regional Airport

has been in operation since 1950, and currently provides a variety of aviation services such as fuel and line service, airframe and propulsion (A/P) service, air charter/taxi service, aircraft maintenance and parts, aircraft rental, flight training, pilot supplies, catering, and aircraft storage. Additionally, the regional airport serves as a US government refueling facility and provides weather center information for the area (USAF 2003a). The airport is currently supported by American Eagle flights, a component of American Airlines Corporation. The airport hosts seven daily American Eagle flights to and from Dallas, Texas.



**Figure 3-1 Regional Map of Proposed Areas**

### 3.2.3 Fort Sill

Fort Sill is located adjacent to Lawton, Oklahoma along the northern edge of the city (Figure 3-1). The installation covers approximately 94,221 acres and is the primary location for all field artillery training for both the US Army and Marines (US Army 2002a). In January 1869, General Philip H. Sheridan founded Fort Sill as a cavalry post. The post's primary mission was to suppress Indian raids on settlements in Texas, Kansas, and Colorado, and protect Indian lands from encroachment by settlers. In 1902, the installation changed from a cavalry post to a field artillery center. As the mission at Fort Sill continued to evolve, the first aircraft arrived in 1915; however, the Henry Post AAF, which is part of Fort Sill, was not established until 1917 (US Army 2002b). From 1917 to present, Fort Sill has continued to support the training and advancement of infantry and artillery soldiers for the US Army. Currently, the post serves as a training installation for the US Army Training and Doctrine Command (TRADOC) (US Army 1996). There are three main training organizations stationed at Fort Sill: 1) Field Artillery School; 2) Field Artillery Training Center; and 3) the Third Armored Corps Artillery. All three organizations help to support the installation's mission to train artillery soldiers (US Army 2002c).

## 3.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

### 3.3.1 Noise

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive, or stationary or transient. Stationary sources are normally related to specific land uses (e.g., housing tracts or industrial plants). Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports) or randomly (e.g., thunder, high winds). There is a wide range of diversity in a receptor's responses to noise. That response can vary according to the type of noise and the characteristics of the sound source but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

The physical characteristics of noise, or sound, include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the eardrum. This is similar to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses a louder noise. The unit used to measure the intensity of sound is the decibel (dB). Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range. The logarithm, and its use, is nothing more than a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is -6 (minus 6). Obviously, as more zeros are added

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before or after the decimal point, converting these numbers to their logarithms greatly simplifies calculations that use these numbers.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed A-weighted, and are shown in terms of A-weighted decibels (dBA).

The duration of a noise event and the number of times noise events occur are also important considerations in assessing noise impacts. As a basis for comparison when noise levels are considered, it is useful to note that at distances of about three feet, noise from normal human speech ranges from 63 to 65 dB, operating kitchen appliances range from about 83 to 88 dB, and rock bands approach 110 dB.

The word metric is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning or interpretation. Each metric has been developed by researchers attempting to represent the effects of environmental noise.

The metrics supporting the assessment of noise from aircraft operations associated with the proposals assessed in this document are the maximum sound level ( $L_{max}$ ), the Sound Exposure Level (SEL), and Day-Night Average Sound Levels ( $L_{dn}$ ). Each metric represents a tier for quantifying the noise environment and is briefly discussed below.

### **Maximum Sound Level**

The  $L_{max}$  metric defines peak noise levels.  $L_{max}$  is the highest sound level measured during a single noise event (e.g., an aircraft overflight) and is the sound actually heard by a person on the ground. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance. Maximum sound level is important in judging a noise event's interference with conversation, sleep, or other common activities.

This document considers noise from aircraft operating around airfields with the primary operational modes of aircraft being approaches and departures. Table 3-1 shows  $L_{max}$  values at various distances associated with typical military and civilian aircraft operating at the military and civilian airfields associated with the proposals addressed in this document.

**Table 3-1 Representative Maximum Sound Levels**

<b>Aircraft and Power Type</b>	<b>L<sub>max</sub> Values (in dBA) At Varying Distances (in feet)</b>					
	<b>500</b>	<b>1,000</b>	<b>2,000</b>	<b>3,000</b>	<b>5,000</b>	<b>10,000</b>
C-17 Takeoff	101.8	94.5	86.6	81.4	74.8	65.0
C-17 Landing	89.3	81.3	72.5	67.2	60.4	50.2
KC-135R Takeoff	93.9	87.1	79.8	75.2	68.9	59.1
KC-135R Landing	90.4	83.4	75.8	70.9	64.4	54.2
T-37 Takeoff	98.3	91.0	82.9	77.6	70.4	59.3
T-37 Landing	91.5	84.2	76.3	71.1	64.1	53.4
SAAB 340 Takeoff	86.4	79.8	73.0	68.7	63.2	54.6
SAAB 340 Landing	77.1	70.4	63.5	59.1	53.5	45.1
Lear Jet 25 Takeoff	109.5	102.3	94.4	89.2	82.1	71.0
Lear Jet 25 Landing	83.8	76.7	68.8	63.5	56.4	45.2

Source: USAF 2003b

L<sub>max</sub> maximum sound level

dBA A-weighted decibels

**Sound Exposure Level**

L<sub>max</sub> alone may not represent how intrusive an aircraft noise event is, because it does not consider the length of time that the noise persists. The SEL metric combines intensity and duration into a single measure. It is important to note, however, that SEL does not directly represent the sound level heard at any given time but rather provides a measure of the total exposure of the entire event. Its value represents all of the acoustic energy associated with the event as though it was present for one second. Therefore, for sound events that last longer than one second, the SEL value will be higher than the L<sub>max</sub> value. The SEL value is important, because it is the value used to calculate other time-averaged noise metrics. Table 3-2 shows SEL values corresponding to the aircraft and power settings reflected in Table 3-1.

**Table 3-2 Representative Sound Exposure Levels**

<b>Aircraft and Power Type</b>	<b>SEL Values (in dBA) At Varying Distances (in Feet)</b>					
	<b>500</b>	<b>1,000</b>	<b>2,000</b>	<b>3,000</b>	<b>5,000</b>	<b>10,000</b>
C-17 Takeoff	105.5	100.0	93.9	89.8	84.5	76.5
C-17 Landing	94.3	88.0	81.1	76.8	71.3	63.0
KC-135R Takeoff	97.2	92.2	86.7	83.1	78.2	70.2
KC-135R Landing	96.0	90.8	85.0	81.2	76.0	67.6
T-37 Takeoff	103.2	97.7	91.4	87.2	81.4	72.1
T-37 Landing	98.2	92.7	86.5	82.5	76.8	67.9
SAAB 340 Takeoff	92.1	87.3	82.3	79.1	74.9	68.1
SAAB 340 Landing	82.4	77.5	72.3	69.1	64.8	58.1
Lear Jet 25 Takeoff	115.3	110.0	103.9	99.8	94.0	84.6
Lear Jet 25 Landing	90.3	85.0	78.9	74.7	68.9	59.5

Source: USAF 2003b

SEL sound exposure level

dBA A-weighted decibels

**Time-Averaged Cumulative Day-Night Average Noise Metrics**

The number of times aircraft noise events occur during given periods is also an important consideration in assessing noise impacts. The cumulative noise metric supporting the analysis of multiple time-varying aircraft events is the  $L_{dn}$ .

**Day-Night Average Sound Level**

This metric sums the individual noise events and averages the resulting level over a specified length of time. Thus, it is a composite metric that considers the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. As part of this metric, a 10 dB penalty is added to those events that occur between 10:00 p.m. and 7:00 a.m. This 10-dB penalty accounts for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime. This cumulative metric does not represent the variations in the sound level heard. Nevertheless, it does provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Finally, it should be noted that ambient background noise was not considered in the aircraft noise calculations that are presented below. There are two reasons for this. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10-dBA variance in sound levels simply due to an increase in wind velocity (Harrison 1973). Therefore, assigning a value to background noise would be arbitrary. Secondly, and probably most important, is the reasonable assumption that ambient background noise in the project's region of influence (ROI) would have little or no effect on the calculated  $L_{dn}$ . In calculating noise levels, louder sounds dominate the calculations, and overall, aircraft noise would be expected to be the dominant noise source characterizing the acoustic conditions in the region.

Using measured sound levels as a basis, the Air Force developed several computer programs to calculate noise levels resulting from aircraft operations. Sound levels calculated by these programs have been extensively validated against measured data and have been proven to be highly accurate.

In this document, the sound levels calculated for aircraft operations in an airfield environment are all Daily  $L_{dn}$ .  $L_{dn}$  metrics are the preferred noise metrics of the Department of Housing and Urban Development (HUD), the Department of Transportation (DOT), the FAA, the US Environmental Protection Agency (USEPA), and the Veteran's Administration (VA).

Ignoring the night-time penalty for the moment,  $L_{dn}$  may be thought of as the continuous or cumulative A-weighted sound level which would be present if all of the variations in sound level that occur over the given period were smoothed out so as to contain the same total sound energy. While  $L_{dn}$  does provide a single measure of overall

noise impact, it is fully recognized that it does not provide specific information on the number of noise events or the specific individual sound levels that occur. For example, a  $L_{dn}$  of 65 dB could result from a very few noisy events or a large number of quieter events. Although it does not represent the sound level heard at any one particular time, it does represent the total sound exposure. Scientific studies and social surveys have found the  $L_{dn}$  to be the best measure to assess levels of community annoyance associated with all types of environmental noise. Therefore, its use is endorsed by the scientific community and governmental agencies (ANSI 1980, 1988; USEPA 1974; FICUN 1980; FICON 1992).

Additional technical information on the methodology and concept of noise measurement and modeling, as well as data on noise effects, can be found in Appendix D.

Aircrew stationed at Altus AFB conduct training at Altus and other military and civilian airfields in the area around Altus, Oklahoma. The airfields specifically considered in this document are the Henry Post AAF, located on Fort Sill, and the Lawton/Fort Sill Regional Airport, Lawton, Oklahoma. The ROI for the noise assessments is the areas around these locations that are exposed to aviation-related noise resulting from training activities.

### 3.3.1.1 Existing Conditions

Public annoyance is the most common concern associated with exposure to elevated noise levels. When subjected to  $L_{dn}$  levels of 65 dBA, approximately 12 percent of the persons exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is significantly lower (less than three percent), and at levels above 70 dBA, it is significantly higher (greater than 25 percent) (Finegold, et al, 1994). Table 3.3 shows the percentage of the population expected to be highly annoyed at a range of noise levels.

**Table 3-3 Percentage of Population Highly Annoyed  
By Elevated Noise Levels**

Noise Exposure ( $L_{dn}$ in dBA)	Percent Highly Annoyed
< 65	< 12
65 – 70	12 – 21
70 – 75	22 – 36
75 – 80	37 – 53
80 – 85	54 – 70
> 85	> 71

Source: Finegold et al. 1994

$L_{dn}$  Day-Night average Sound Level      dBA      A-weighted decibels

### 3.3.1.2 Aircraft Activity

The following terms are defined to provide a better understanding of how data are developed for input into the various noise models used to calculate noise. Around an airfield, **aircraft operations** are categorized as takeoffs, landings, or closed patterns (which could include activities referred to as touch-and-go operations or low approaches). Each takeoff or landing constitutes one operation. A **closed pattern** occurs when the pilot of the aircraft approaches the runway as though planning to land but then applies power to the aircraft and continues to fly as though taking off again. The pilot then flies a circular or rectangular track around the airfield and again approaches for landing. In some cases, the pilot may actually land on the runway before applying power, or in other cases the pilot may simply approach very close to the ground. In either event, since a closed pattern operation essentially consists of a landing and a takeoff, it is considered two operations.

#### 3.3.1.2.1 Lawton/Fort Sill Regional Airport

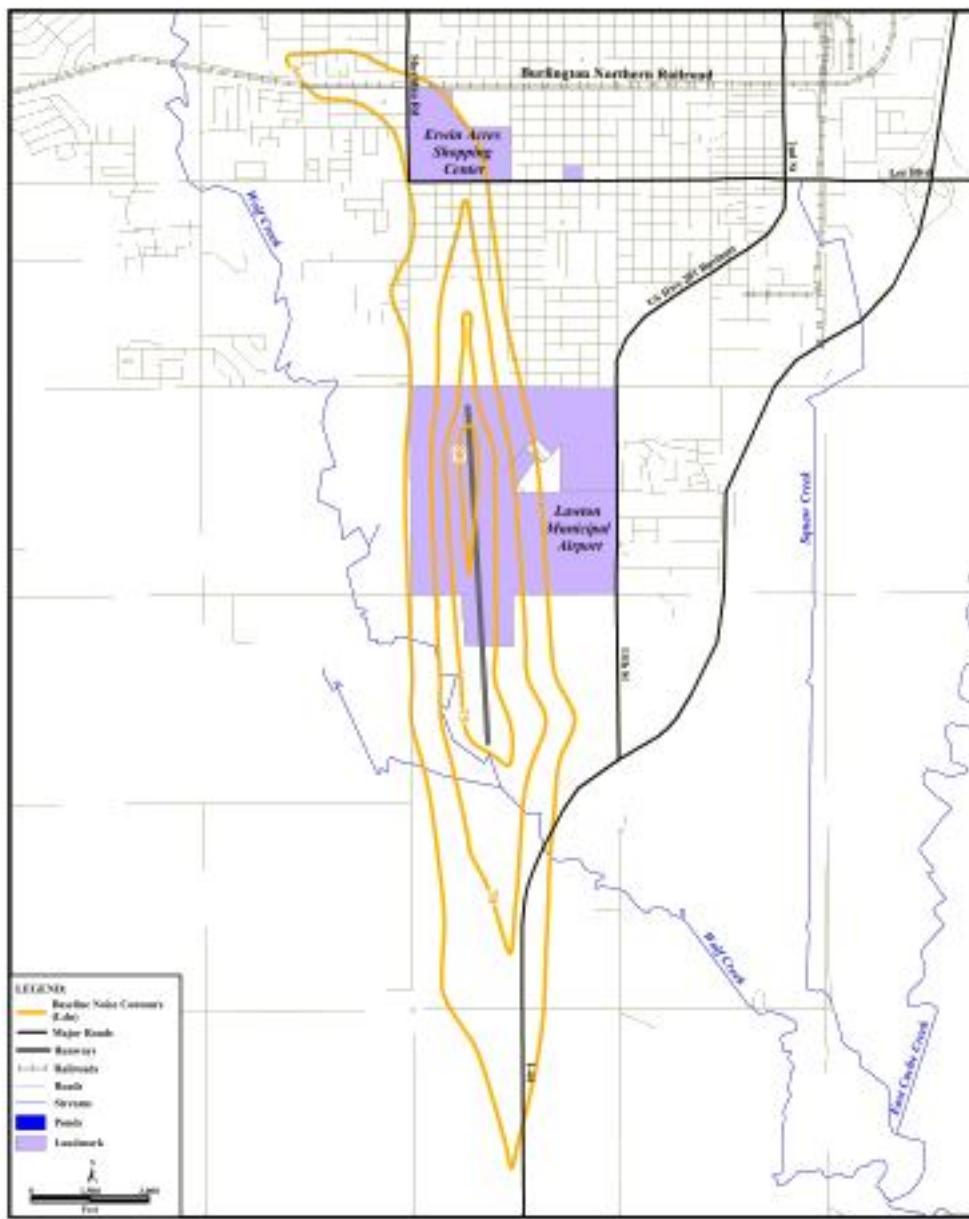
Aircrews from Altus AFB and other military installations currently conduct flight operations training at the regional airport. During Fiscal Year 2002, the Lawton/Fort Sill Regional Airport supported almost 45,000 annual aviation operations. Average daily operations at the facility are shown in Table 3-4. Land area and population exposed to elevated noise levels are described in Table 3-5, and noise contours are illustrated in Figure 3-2.

**Table 3-4 Average Daily Operations  
at Lawton/Fort Sill Regional Airport - Baseline Conditions<sup>1</sup>**

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
Air Taxi	4.193	0.799	4.193	0.799	0.000	0.000
General Aviation	7.911	0.096	7.911	0.096	5.340	0.000
Military	3.710	0.000	3.710	0.000	58.157	0.000
Total	15.814	0.895	15.814	0.895	63.497	0.000

Note <sup>1</sup> Daily operations are based on averages of annual operations; therefore, numbers do not round.  
Source: Lawton/Fort Sill Regional Airport 2003

## *Affected Environment*



**Figure 3-2 Lawton/Fort Sill Regional Airport - Baseline Noise Contours**

**Table 3-5 Land Area and Population Exposed  
to Indicated Sound Levels - Baseline Conditions  
at Lawton/Fort Sill Regional Airport**

Sound Level (In L <sub>dn</sub> )	Acres of Land <sup>1</sup>	Population
65 – 70	1,062.93	820
70 – 75	464.40	100
75 – 80	210.31	3
80 – 85	24.26	0
> 85	0	0

Note: <sup>1</sup> Land areas exposed to indicated sound levels. Total area exposed to Ldn 65 or greater is approximately 1,761 acres

Sources: Wasmer and Maunsell 2002  
USCB 2000.

L<sub>dn</sub> Day-Night average Sound Level

As a result of this exposure and using the annoyance factors defined in Table 3-3, an estimated 160 persons would be expected to be highly annoyed by the noise generated by the current flight operations at the regional airport (Finegold et al 1994).

### 3.3.1.2.2 Henry Post AAF

Under current conditions, the Henry Post AAF supports military and civil aviation activity. During Fiscal Year 2002, the airfield supported more than 17,000 aviation operations. Considering all types of flight activities, a scenario representing an “average day’s” operations was developed. The operations considered include arrivals (landings), departures (takeoffs), and closed patterns around the airfield. Noise calculations consider the frequency of flight operations, runway utilization, and the flight tracks and flight profiles flown by each aircraft. The numbers and types of representative operations addressed are shown in Table 3-6.

**Table 3-6 Average Daily Operations  
at Henry Post Army Airfield - Baseline Conditions<sup>1</sup>**

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
Military	3.979	0.000	3.979	0.000	23.874	0.000
Civil	0.295	0.000	0.295	0.000	1.769	0.000
<b>Total</b>	<b>4.274</b>	<b>0.000</b>	<b>4.274</b>	<b>0.000</b>	<b>25.643</b>	<b>0.000</b>

Note <sup>1</sup> Daily operations are based on averages of annual operations; therefore, numbers do not round.

Source: US Army 2003

These levels and types of activity are then combined with information on climatology, maintenance activities, and aircraft flight parameters, and processed through the Air Force's BASEOPS/NOISEMAP (Moulton 1990) computer models to calculate  $L_{dn}$ . Once noise levels are calculated, they are plotted on a background map in 5-decibel increments from 65 dBA to 85 dBA, as applicable. Noise contours associated with "baseline" activities at Henry Post AAF are shown in Figure 3-3. The land area encompassed by each contour and the population exposed to those noise levels are shown in Table 3-7.

**Table 3-7 Land Area and Population Exposed To Indicated Sound Levels - Baseline Conditions at Henry Post AAF**

Sound Level (in $L_{dn}$ )	Acres of Land <sup>1</sup>	Population
65 – 70	187.67	150
70 – 75	102.89	88
75 – 80	31.87	27
80 – 85	6.31	8
> 85	0.52	1

Note: <sup>1</sup> Land areas exposed to indicated sound levels. Total area exposed to  $L_{dn}$  65 or greater is approximately 329 acres

Sources: Wasmer and Maunsell 2002.  
USCB 2000

$L_{dn}$  Day-Night average Sound Level

As a result of this exposure and using the annoyance factors defined in Table 3-3, an estimated 67 persons would be expected to be highly annoyed by the noise created by the current flight operations at the airfield (Finegold, et al 1994).

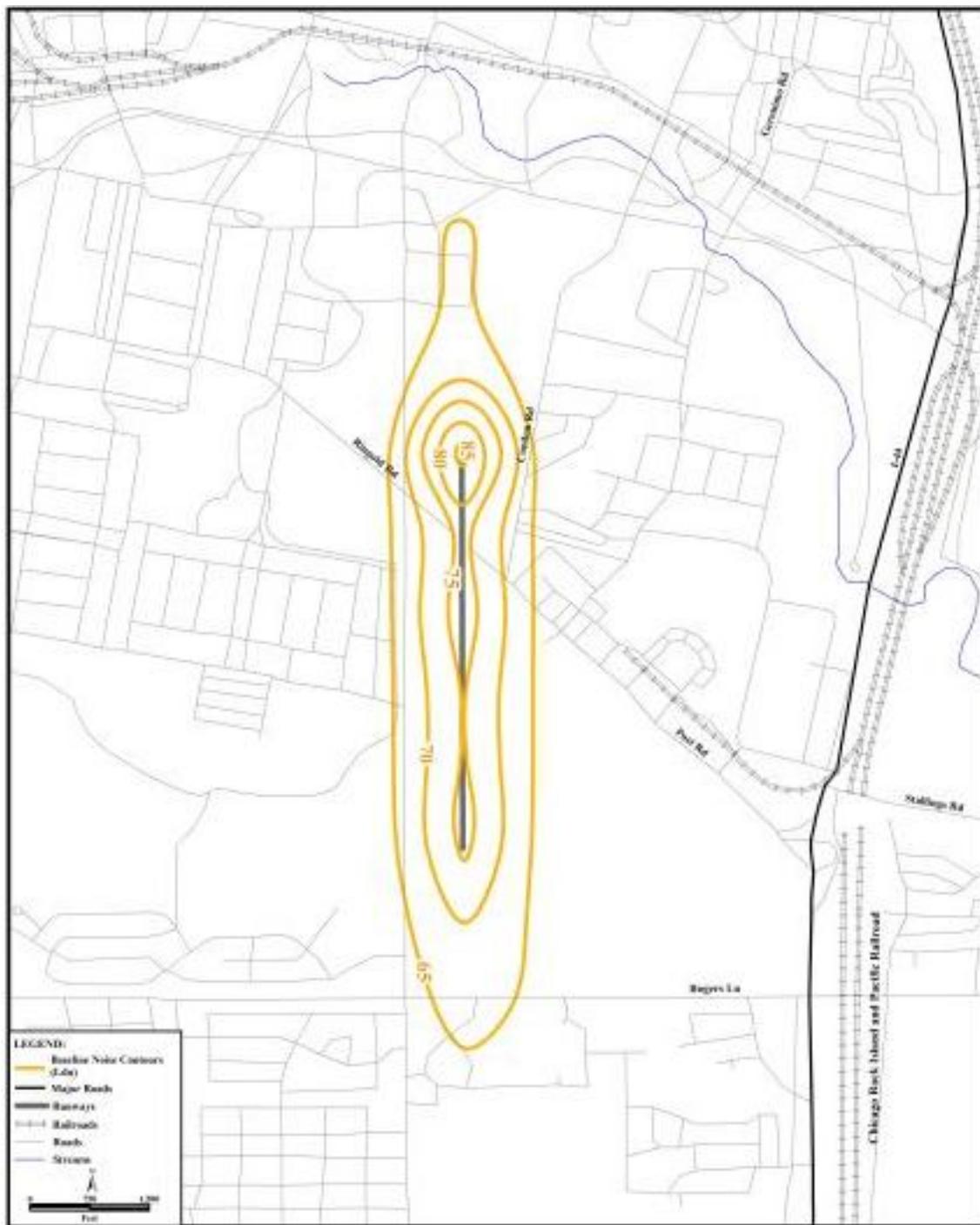
### 3.3.1.3 Ground-Based Activity

Some additional noise results from day-to-day activities associated with operations, maintenance, and the industrial functions associated with the operation of the airfields are also addressed in this document. These noise sources include the operation of ground-support equipment and other transportation noise from vehicular traffic. However, this noise is generally localized in industrial areas on or near the airfield or on established lines of communication supporting traffic to-and-from the airfields. Noise resulting from aircraft operations remains the dominant noise source in the airfield region.

### 3.3.2 Air Quality

Air resources describe the existing concentrations of various pollutants and the climatic and meteorological conditions that influence the quality of the air. Precipitation, wind direction, wind speed, and atmospheric stability are factors that determine the extent of pollutant dispersion.

The ROI is the area around Lawton/Fort Sill Regional Airport and Henry Post AAF in Comanche County, Oklahoma.



**Figure 3-3 Henry Post AAF - Baseline Noise Contours**

### **3.3.2.1 Meteorology**

The meteorology at and around Lawton, Oklahoma is extremely diverse. Location, air-mass characteristics, and the jet stream combine to create a wide range of weather activity. As a result, atmospheric conditions may change suddenly and without warning (USAF 1993).

The location of the Lawton/Fort Sill Regional Airport and Henry Post AAF is an important factor in regional weather conditions. Maritime tropical air masses from the Gulf of Mexico move seasonally over the eastern portion of North America. The north-central part of Mexico spawns dry, hot continental air masses. These two air masses dominate the weather activity of southwestern Oklahoma. Lawton, Oklahoma has a humid, subtropical climate; more rainfall occurs during the warmest six months of the year than the coldest six months. Severe weather conditions may manifest as droughts, tornadoes, and blizzards (USAF 1993).

The average annual mean temperature for Lawton, Oklahoma is 62 degrees Fahrenheit (°F). The average temperature during the summer months is 83°F with record extremes ranging from 49°F to 116°F. The average mean temperature during the winter is 38°F with record extremes ranging from -4°F to 91°F. Lawton, Oklahoma averages 24 days per year with temperatures in excess of 100°F and 94 days with temperatures above 90°F. Sub-freezing temperatures occur an average of 73 days per year with 3 days per year reaching below 10°F (USAF 1993).

The average annual relative humidity is 72 percent in the morning and 46 percent in early afternoon. Mean precipitation is 24.7 inches per year with May being the wettest month and January the driest. Mean snowfall averages 7 inches per year with most occurring in February (USAF 1993).

The predominant wind direction is from the southeast. The average wind velocity is 6 knots with a maximum recorded wind speed of 82 knots. Thunderstorms occur an average of 46 days per year. Fog, with accompanying visibility less than 7 miles, occurs an average of 69 days per year with extremes of 8 days per month from December through March (USAF 1993).

### **3.3.2.2 Air Pollutants and Regulations**

#### **National Ambient Air Quality Standards**

Under the authority of the Clean Air Act (CAA), the USEPA has established primary and secondary National Ambient Air Quality Standards (NAAQS). Primary, NAAQS define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary, NAAQS define levels of air quality necessary to protect public welfare (i.e., soils, vegetation, and wildlife) from any known or anticipated adverse effects of a pollutant. Federal NAAQS are currently established for six pollutants (known as criteria pollutants); including carbon monoxide (CO), nitrogen dioxide, ozone (O<sub>3</sub>), sulfur oxides

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(SO<sub>x</sub>, commonly measured as sulfur dioxide), lead, and particulate matter less than 10 microns in diameter (PM<sub>10</sub>). Although O<sub>3</sub> is considered a criteria pollutant and is measurable in the atmosphere, it is not often considered a pollutant when reporting emissions from specific sources. O<sub>3</sub> is not typically emitted directly from most emissions sources. It is formed in the atmosphere from its precursors, nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs), which are directly emitted from various sources. Thus, NO<sub>x</sub> and VOCs are commonly reported instead of O<sub>3</sub>.

The NAAQS are defined in terms of concentration (e.g., parts per million [ppm] or micrograms per cubic meter [ $\mu\text{g}/\text{m}^3$ ]) determined over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour periods) were established for pollutants with acute health effects and may not be exceeded more than once a year. Long-term standards (annual periods) were established for pollutants with chronic health effects and may never be exceeded.

In 1997, the USEPA promulgated two new standards: a new 8-hour O<sub>3</sub> standard (which will eventually replace the existing 1-hour O<sub>3</sub> standard) and a new standard for particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>), which are fine particulates that have not been previously regulated. In addition, the USEPA revised the existing PM<sub>10</sub> standard. The two new standards are scheduled for implementation over the next few years as monitoring data becomes available to determine the attainment status of areas in the United States.

### **State Air Quality Standards**

Under the CAA, state and local agencies may establish ambient air quality standards and regulations of their own, provided these are at least as stringent as the federal requirements. For the criteria pollutants of concern, Oklahoma's standards are the same as the federal standards. Table 3-8 summarizes the federal standards associated with criteria pollutants.

### **Attainment Areas**

The USEPA classifies the air quality within an air quality control region (AQCR) according to whether the region meets federal primary and secondary NAAQS. An AQCR or portion of an AQCR may be classified by the USEPA as attainment, nonattainment, or unclassified for each of the six criteria pollutants. Attainment describes a condition in which one or more of the six NAAQS are being met in an area. The area is considered to be "attainment" only for those criteria pollutants for which the NAAQS are being met. Nonattainment describes a condition in which one or more of the six NAAQS are not being met in an area. Unclassified indicates that the air quality in the area cannot be classified and is, therefore, treated as attainment. An area may have all three classifications for different criteria pollutants.

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**Table 3-8 National Ambient Air Quality Standards**

Pollutant	Standard Value ( $\mu\text{g}/\text{m}^3$ ) <sup>a</sup>	Standard Type
CO	40,000	Primary
	10,000	Primary
$\text{NO}_2$	100	Primary and secondary
	Annual average	
$\text{O}_3$	0.12	Primary and secondary
	8 hr average <sup>b</sup>	Primary
Lead	1.5	Primary
	Quarterly average	
$\text{PM}_{10}$	150	Primary and secondary
	50	Primary and secondary
$\text{PM}_{2.5}$	65	Primary
	15	Primary
$\text{SO}_2$	1,300	Secondary
	365	Primary
	80	Primary
<p><sup>a</sup> Except for parts per million for ozone.</p> <p><sup>b</sup> New ozone 8 hr standard does not become effective until an area demonstrates compliance with existing 1 hr standard.</p> <p><sup>c</sup> Existing 24 hr standard for particulate matter equal to or less than 10 micrometers in aerodynamic diameter (<math>\text{PM}_{10}</math>) will remain in effect but will be adjusted to 99th percentile of concentrations within an area.</p> <p><sup>d</sup> Existing annual standard will remain in effect as is.</p> <p><sup>e</sup> New <math>\text{PM}_{2.5}</math> 24 hr standard is based on 98th percentile of concentrations over 1 year (averaged over 3 years) at population-oriented monitors using highest measured values.</p> <p><sup>f</sup> New <math>\text{PM}_{2.5}</math> annual standard is based on 3-year average of annual arithmetic means.</p>		
$\text{PM}_{2.5}$	less than 2.5 microns in diameter	$\text{SO}_2$ sulfur oxides
$\text{PM}_{10}$	less than 10 microns in diameter	$\text{O}_3$ ozone
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter	$\text{NO}_2$ nitrate
CO	carbon monoxide	hr hour

Air quality management at Air Force installations is established in Air Force Instruction (AFI) 32-7040, *Air Quality Compliance*. AFI 32-7040 requires installations to achieve and maintain compliance with all applicable federal, state, and local standards for air quality compliance. Air quality compliance involves prevention, control, abatement, documentation, and reporting of air pollution from stationary and mobile sources. Maintaining compliance with air quality regulations may require reduction or elimination

of pollutant emissions from existing sources and control of new pollution sources (USAF 1994).

### **State Implementation Plan**

The CAA of 1977 set provisions for attainment and maintenance of the NAAQS. For non-attainment regions, states are required to establish a State Implementation Plan (SIP) designed to eliminate or reduce the severity and number of NAAQS violations with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS by specific deadlines. This plan is to be prepared by local agencies and incorporated into the overall SIP for each state.

The CAA of 1990 established new federal nonattainment classifications, new emission control requirements, and new compliance dates for nonattainment areas. The requirements and compliance dates are based on the severity of nonattainment classification.

### **Prevention of Significant Deterioration**

Section 162 of the CAA further established the goal of prevention of significant deterioration (PSD) of air quality in all international parks, national parks which exceeded 6,000 acres, and national wilderness areas that exceeded 5,000 acres if these areas were in existence on 7 August 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states or tribal nations, in addition to the federal government, have the authority to redesignate certain areas as (non-mandatory) PSD Class I areas, i.e., a National Park or national wilderness area established after 7 August 1977 that exceeds 10,000 acres. PSD Class I areas are areas where any appreciable deterioration of air quality is considered significant. Class II areas are those where moderate, well-controlled growth could be permitted. Class III areas are those designated by the governor of a state as requiring less protection than Class II areas. No Class III areas have yet been designated. The nearest mandatory PSD Class I area to the region potentially affected by the proposed action is Wichita Mountains Wild. This 8,900-acre area is managed by the US Fish and Wildlife Service (USFWS) and is located approximately 20 miles northwest of the proposed sites.

### **Visibility**

CAA Section 169A established the additional goal of prevention of further visibility impairment in the PSD Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. The USEPA is implementing a Regional Haze rule for PSD Class I areas that will address contributions from mobile sources and pollution transported from other states or regions. Emission levels are used to qualitatively assess potential impairment to visibility in PSD Class I areas.

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Decreased visibility may potentially result from elevated concentrations of PM<sub>10</sub> and SO<sub>2</sub> in the lower atmosphere.

### **3.3.2.3 Regional Air Quality**

The Lawton/Fort Sill Regional Airport and Henry Post AAF are located within the Southwestern Oklahoma Intrastate AQCR (designated as AQCR 189). All 12 counties within this AQCR, including Comanche County, are classified by the USEPA as attainment or unclassified for all criteria pollutants.

An accurate regional emissions inventory is needed for assessing the potential contribution of a source or group of sources to regional air quality. An emissions inventory is an estimate of the actual and potential pollutant emissions generated by a source or sources over a period of time, normally a calendar year. The inventory accounts for permitted stationary sources that are required to report annual emissions to the Oklahoma Department of Environmental Quality (ODEQ). It does not include emissions from mobile sources. Total annual (1997) emissions reported for stationary sources within AQCR 189 (tons per year [tpy]) for five air pollutants are:

- CO–21,374 tpy;
- VOC – 2,560 tpy;
- NO<sub>x</sub> – 14,906 tpy;
- SO<sub>2</sub> – 1,185 tpy; and
- PM<sub>10</sub> – 353 tpy (USAF 2002).

### **Baseline Aircraft Operations**

Baseline emissions from aircraft missions (VFR closed patterns and VFR patterns plus approach and full stop) at Lawton/Fort Sill Regional Airport and Henry Post AAF at Fort Sill were calculated using emission factors, flight profiles, and power settings for each aircraft from the available literature (Jagielski and O'Brien 1994; EPA 1992; USAF 2002a; USAF 2002b; Gunston 1995; Hewson 1996). Baseline criteria air pollutant emissions from these aircraft operations at Lawton/Fort Sill Regional Airport and Henry Post AAF are shown in Tables 3-9 and 3-10, respectively. The emission factor for SOx was based upon the national average sulfur content of 0.027 percent in aviation fuels (USEPA 1992). The emissions of particulate matter were calculated based on emission factors for total suspended particulates (i.e., particulates that are less than 30 microns in diameter), which includes PM<sub>10</sub> as a component. Because the NAAQS is for PM<sub>10</sub>, all particulates are conservatively assumed to be PM<sub>10</sub>.

**Table 3-9 Baseline Emissions from Aircraft Operations at Lawton/Fort Sill Regional Airport**

Aircraft Operations	Annual Number	Annual Emissions (tons/year)				
		CO	VOC	NOx	SOx	PM <sub>10</sub>
VFR/Approach/Full-stop	<b>5,680</b>	29.5	8.4	4.8	0.3	0.4
VFR Patterns	<b>16,597</b>	37.3	1.7	60.3	2.2	3.1
<b>Total Emissions</b>		<b>66.9</b>	<b>10.1</b>	<b>65.1</b>	<b>2.5</b>	<b>3.5</b>
CO Carbon monoxide			NO <sub>x</sub> nitrogen oxides			
PM <sub>10</sub> Less than 2.5 microns in diameter			SO <sub>x</sub> sulfur oxides			
VOC volatile organic compounds						

**Table 3-10 Baseline Emissions from Aircraft Operations at Henry Post AAF**

Aircraft Operations	Annual Number	Annual Emissions (tons/year)				
		CO	VOC	NOx	SOx	PM <sub>10</sub>
VFR/Approach/Full-stop	<b>1,068</b>	10.3	1.8	0.9	0.1	0.1
VFR Patterns	<b>6,411</b>	19.0	0.6	4.6	0.4	0.3
<b>Total Emissions</b>		<b>29.3</b>	<b>2.4</b>	<b>5.5</b>	<b>0.5</b>	<b>0.4</b>
CO Carbon monoxide			NO <sub>x</sub> nitrogen oxides			
PM <sub>10</sub> Less than 2.5 microns in diameter			SO <sub>x</sub> sulfur oxides			
VOC volatile organic compounds						

### 3.3.3 Biological Resources

Given the limited scope of this effort, the potential for the proposed action and alternatives to affect biological resources is limited to those direct, indirect, and cumulative impacts that could be associated with increase flight operations at Lawton/Fort Sill Regional Airport and the Henry Post AAF. Therefore, wildlife resources and threatened and endangered species were discussed in this EA to the level necessary to comply with NEPA.

#### 3.3.3.1 Wildlife

The area surrounding the Lawton/Fort Sill Regional Airport and Henry Post AAF consists predominantly of urban-introduced and adaptive species of vegetation. As such, the variety of the wildlife potentially occurring in the vicinity of the two airfields would be somewhat restricted by the lack of suitable habitat for most bird and mammal species. However, studies implemented by the US Army on Fort Sill have identified over 172 bird and 17 mammal species. Due to the close proximity of the two airfields (less than three miles), it was assumed that species defined for Fort Sill would also have the potential to occur in the Lawton area as well.

Of the bird species recorded on Fort Sill, common game birds (i.e., bobwhite quail – *Colinus virginianus*, mourning dove – *Zenaida macroura*, and wild turkey – *Meleagris gallopavo*) and water fowl (i.e., Canadian goose – *Branta Canadensis*, common snipe – *Capella gallinago*, ringed-neck duck – *Aythya collaris*, and wood duck – *Aix sponsa*) frequent those riparian habitats associated with creeks and ponds. Birds of prey or raptors (i.e., northern harrier – *Circus cyaneus*, Mississippi kite – *Ictinic mississippiensis*, redtailed hawk – *Buteo jamaicensis*, great-horned owl – *Bulio virginianus*, and barred owl – *Strix varia*) were also observed on post in open areas and fields (US Army 1996).

At least 17 mammal species have been observed on and in the area of Fort Sill. Common big game species include white tailed deer (*Odocoileus virginianus*) and elk (*Cervus elephus*). Some of the smaller mammals include cottontail rabbits (*Sylvilagus flordanus*), fox squirrels (*Sciurus niger*), raccoons (*Procyon lotor*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), gray foxes (*Urocyon cinereoargenteus*), beavers (*Castor Canadensis*), Norway rats (*Rattus norvegicus*), red bats (*Lasiusurus borealis*), and Brazilian free-tailed bats (*Tadarida brasiliensis*) (US Army 1996).

Bird-aircraft strikes are considered a flight safety issue related to migratory and resident birds. The airspace utilized by aircraft performing training operations from Altus AFB has been assessed in regard to bird-aircraft strike hazards. The analysis concluded that in relation to bird-strike potential, only moderate to occasional bird activity exists in the vicinity of Lawton/Fort Sill Regional Airport and Henry Post AAF (US Army 1996).

### **3.3.3.2 Threatened and Endangered Species**

A listed species, provided protection under the Endangered Species Act, is so designated because of danger of its extinction as a consequence of economic growth and development without adequate concern and conservation. The USFWS denotes the status of a species for listing as threatened or endangered by category classification. A Category 1 candidate is a species where sufficient information exists to support a threatened or endangered listing, but the proposed rules for listing have not yet been issued. A Category 2 candidate is a species that is under consideration for listing as threatened or endangered, but not enough information is known to merit listing (USAF 1993).

The Oklahoma Department of Wildlife Conservation, Oklahoma Biological Survey, and the USFWS were consulted on the potential for listed threatened, endangered, and candidate species to occur on or migrate through the project area. Correspondence from the Oklahoma Department of Wildlife Conservation is in Appendix C. Other agency correspondence is pending.

Although there are no known federal or state listed threatened or endangered plant species located in the immediate project area, several protected species have the potential to occur in Comanche County (US Army 1996). These species are listed in Table 3-11.

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**Table 3-11 Federal and State Listed Threatened and Endangered Species**

Scientific Name	Common Name	Status	Occurrence
<i>Vireo atricapillus</i>	black capped vireo	E	3
<i>Grus americana</i>	whooping crane	E	3
<i>Falco peregrinus anatum</i>	American peregrine falcon	E, SE	3
<i>Haliaeetus leucocephalus</i>	bald eagle	E, SE	3
<i>Falco peregrinus tundrius</i>	artic peregrine falcon	T, SE	3

Source: US Army 1996  
SE = State Endangered range  
ST = State Threatened  
E = Endangered  
T = Threatened

Occurrence:  
1 = Known to occur on property  
2 = Seasonal occurrence  
3 = Occurrence probable  
4 = Property is within species range

### 3.3.4 Environmental Justice

Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, issued 11 February 1994 and the accompanying Presidential Transmittal Memorandum stipulate that “Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA (42 United States Code [USC] Section 4321, et. seq.)” Although an environmental justice analysis is not mandated by NEPA or by AFI 32-7061, the DoD has directed that NEPA will be used as the primary approach to implement the provisions of the EO.

The 2000 Census of Population and Housing reports numbers of both poverty level and minority residents. Low-income economic status is reported as the number of families with income below the poverty level (\$17,463 for a family of four in 2000). Minority populations included in the census are identified as Black, American Indian and Alaska Native, Asian, Native Hawaiian or other Pacific Islander, Other, or of Hispanic origin. According to the United States Census Bureau (USCB), the Hispanic origin designation is separate from the ethnic (racial) designation, as Hispanic persons can be of any race (USCB 2002). In other words, a person is white (Caucasian) and Hispanic, or white and non-Hispanic, or black and Hispanic, or black and non-Hispanic, and so on. The Hispanic population is not broken out by race for this analysis. Within this document, to avoid confusion and eliminate double counting, the Hispanic population is differentiated from ethnic (racial) minority.

As shown in Table 3-12, the 2000 Census found that the population of Comanche County was approximately 65 percent Caucasian, 19 percent African-American, less than 7.6 percent Asian, Hawaiian and Native American combined, and 3.5 percent categorized as Other Race. In Comanche County, 8.4 percent of the

population is considered Hispanic; as explained above, Hispanic individuals can be of any race (USCB 2002).

By comparison, the population of Oklahoma is a little more than 76 percent Caucasian, less than 8 percent African American, less than 9.4 percent Asian, Hawaiian or Native American, and about 2.4 percent Other Race, with more than 5 percent of the population being Hispanic origin. The United States as a whole is approximately 75 percent Caucasian and 12 percent African-American. Persons of Hispanic origin make up nearly 13 percent of the U.S. total population (USCB 2002).

Nearly 30 percent of Harmon County's population falls below the poverty level, while approximately 17 percent of the state's population and 13 percent of the U.S. population are in this category (USCB 2002).

**Table 3-12 Racial, Hispanic, and Poverty Characteristics, 2000**

Area	Percent of Total Population						Percent Hispanic Origin (can be any race)	Percent below Poverty
	White	Black	American Indian/Alaska Native	Asian	Native Hawaiian or other Pacific Islander	Other Race		
Comanche County	65.2	19.0	5.1	2.1	0.4	3.5	8.4	15.6
State of Oklahoma	76.2	7.6	7.9	1.4	0.1	2.4	5.2	14.7
United States	75.1	12.3	0.9	3.6	0.1	5.5	12.5	13.3

Source: USCB 2002

## **CHAPTER 4**

### **ENVIRONMENTAL CONSEQUENCES**

#### **4.1 INTRODUCTION**

This chapter describes potential impacts that could occur if the proposed action or the no-action alternative is implemented at Lawton/Fort Sill Regional Airport and Henry Post AAF. Additionally, potential cumulative impacts are also discussed in this chapter. Any resultant irreversible or irretrievable resource commitments are noted. Significance criteria used to evaluate potential impacts are discussed at the beginning of each resource area. As discussed in Chapter 3, only those resource areas that would be impacted by the proposed action and alternatives were included in this chapter.

The primary missions and operations of Altus AFB, Fort Sill, and Lawton/Fort Sill Regional Airport would continue. However, the implementation of the proposed action would allow Altus AFB to more effectively meet mission requirements.

#### **4.2 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT**

##### **4.2.1 Noise**

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Concerns regarding aircraft noise relate to certain potential impacts such as hearing loss, non-auditory health effects, annoyance, speech interference, sleep interference, and effects on domestic animals, wildlife, structures, terrain, and historic and archaeological sites.

###### **4.2.1.1 Significance Criteria**

Noise levels resulting from all aviation activities were modeled using the Air Force's BASEOPS/NOISEMAP model. Noise levels associated with operations in the airfield environment resulting from the proposed action and the no-action alternative were calculated and compared with current conditions to assess impacts. Data developed during this process also supported analyses in other resource areas.

Based on numerous sociological surveys and recommendations of federal interagency councils, the most common benchmark referred to is a  $L_{dn}$  of 65 dBA. This threshold is often used to determine residential land use compatibility around airports or highways. By extension, it is often used as a criterion in airspace planning. Two other average noise levels are also useful:

- A Day-Night Average Noise Level of 55 dBA was identified by the USEPA as a level ". . . requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1974). Noise may be heard, but there is no risk to public health or welfare.
- A Day-Night Average Noise Level of 75 dBA is a threshold above which effects other than annoyance may occur. It is 10 to 15 dBA below levels at which hearing damage is a known risk (OSHA 1983). However, it is also a level above which some adverse health effects cannot be categorically discounted.

Public annoyance is the most common impact associated with exposure to elevated noise levels. When subjected to  $L_{dn}$  of 65 dBA, approximately 12 percent of persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is correspondingly lower (less than three percent). The percentage of people annoyed by noise never drops to zero (some people are more sensitive to noise), but at levels below 55 dBA, it is reduced enough to be essentially negligible.

#### **4.2.1.2 Proposed Action**

##### **4.2.1.2.1 Lawton/Fort Sill Regional Airport**

Under the Proposed Action, aircrews from Altus AFB flying C-17 and KC-135R aircraft would also use Lawton/Fort Sill Regional Airport to accomplish some training requirements. C-17 and KC-135R aircrews would fly closed patterns around the airfield.

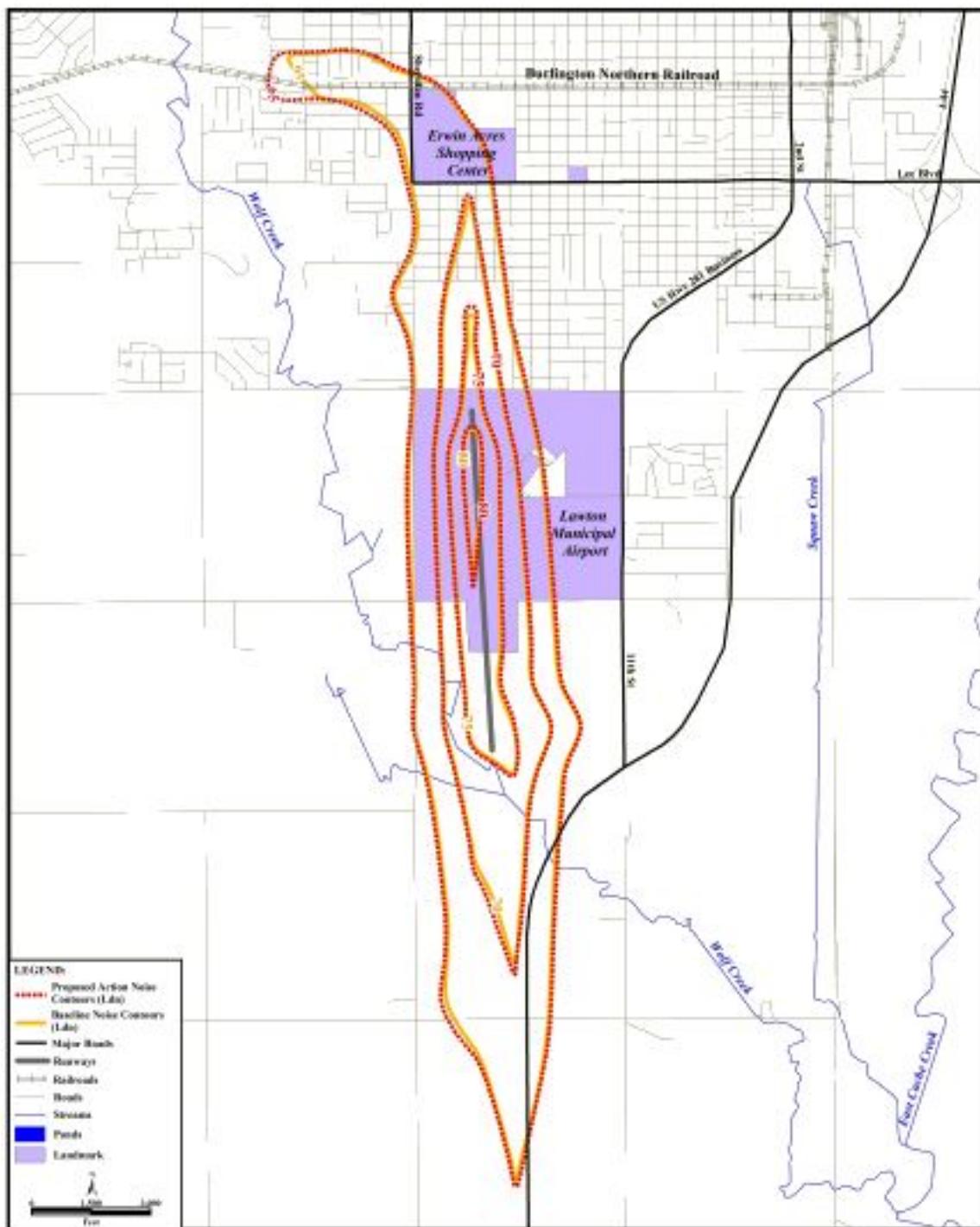
Factors considered in noise analysis around airfields and input requirements for the Air Force's BASEOPS/NOISEMAP model were discussed in Section 3.3.1. Average daily operations at the Lawton/Fort Sill Regional Airport would increase from 96,915 to 112,867, an approximate 16.5 percent increase (Table 4-1).

The noise contours resulting from these changed operations are illustrated in Figure 4-1, and the land areas exposed to elevated noise levels are compared with current conditions in Table 4-2. Changes in population exposure to elevated noise levels are provided in Table 4-3.

**Table 4-1 Average Daily Operations  
at Lawton/Fort Sill Regional Airport - Proposed Action<sup>1</sup>**

<b>Aircraft</b>	<b>Arrivals</b>		<b>Departures</b>		<b>Closed Patterns</b>	
	<b>Day</b>	<b>Night</b>	<b>Day</b>	<b>Night</b>	<b>Day</b>	<b>Night</b>
Air Taxi	4.193	0.799	4.193	0.799	0.000	0.000
General Aviation	7.911	0.096	7.911	0.096	5.340	0.000
Military	3.710	0.000	3.710	0.000	58.157	0.000
C-17	0.000	0.000	0.000	0.000	4.952	0.000
KC-135R	0.000	0.000	0.000	0.000	11.000	0.000
Total	15.814	0.895	15.814	0.895	79.449	0.000

Note <sup>1</sup> Daily operations are based on averages of annual operations; therefore, numbers do not round.  
 Sources: Lawton/Fort Sill Regional Airport 2003  
 USAF 2002a



**Figure 4-1 Lawton/Fort Sill Regional Airport - Proposed Action Noise Contours Overlaid on Baseline Contours**

**Table 4-2 Change in Land Areas Exposed to Indicated Sound Levels at Lawton/Fort Sill Regional Airport**

Sound Level (In L <sub>dn</sub> )	Acres of Land		Change
	Baseline	Proposed Action	
65 – 70	1,062.93	1,120.34	57.41
70 – 75	464.40	482.24	17.84
75 – 80	210.31	226.21	15.90
80 – 85	24.26	28.41	4.15
> 85	0	0	0
<b>Total &gt; 65</b>	<b>1,761.90</b>	<b>1,857.20</b>	<b>95.3</b>

Source: Wasmer and Maunsell 2002  
L<sub>dn</sub> Day-Night Average Sound Level

**Table 4-3 Changes in Population Exposed to Elevated Noise Levels at Lawton/Fort Sill Regional Airport**

Sound Level (In L <sub>dn</sub> )	Population Exposed		Change
	Baseline	Proposed Action	
65 – 70	820	1,008	188
70 – 75	100	125	25
75 – 80	3	4	1
80 – 85	0	0	0
> 85	0	0	0
<b>Total &gt; 65</b>	<b>923</b>	<b>1,137</b>	<b>214</b>

Source: USCB 2000  
L<sub>dn</sub> Day-Night Average Sound Level

Under the proposed action, increased flight operations at the Lawton/Fort Sill Regional Airport would increase the area of land exposed to 65 dBA or greater by 5 percent and the population exposed to 65 dBA or greater by 23 percent. Based on this exposure, it is estimated that 197 persons would be highly annoyed by the increased noise levels associated with this proposal (Finegold et al 1994). This represents an additional 37 persons over baseline conditions.

#### 4.2.1.2.2 Henry Post Army Airfield

Under the Proposed Action, aircrews from Altus AFB flying C-17 and KC-135R aircraft would use the Henry Post AAF to accomplish training requirements. C-17

aircrews would fly closed patterns around the airfield, and train in assault field landings on the current runway. KC-135R aircrews would fly closed patterns.

Factors considered in noise analysis around airfields and input requirements for the Air Force's BASEOPS/NOISEMAP model were discussed in Section 3.3.1. Average daily operations at the Henry Post AAF would increase from 34,191 to 45,857, an approximate 34 percent increase (Table 4-4). The noise contours resulting from these changes in flight operations are shown in Figure 4-2. Additionally the land areas exposed to elevated noise levels are compared with current conditions in Table 4-5, and changes in population exposure to elevated noise levels are detailed in Table 4-6.

**Table 4-4 Average Daily Operations  
at Henry Post AAF - Proposed Action<sup>1</sup>**

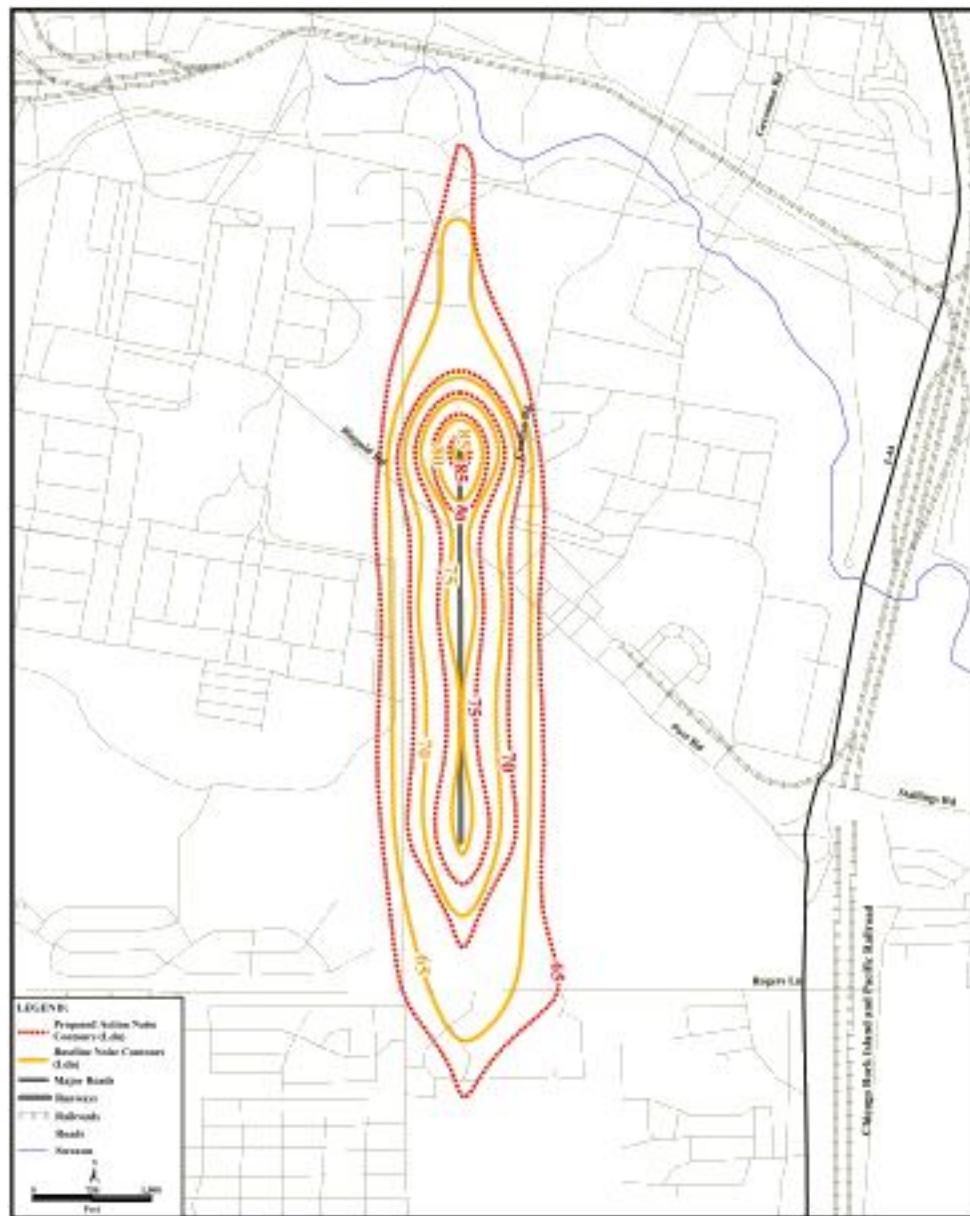
Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
Military	3.979	0.000	3.979	0.000	23.874	0.000
Civil	0.295	0.000	0.295	0.000	1.769	0.000
C-17	2.476	0.000	2.476	0.000	3.714	0.000
KC-135R	0.000	0.000	0.000	0.000	3.000	3.000
Total	6.750	0.000	6.750	0.000	32.357	0.000

Note <sup>1</sup> Daily operations are based on averages of annual operations; therefore, numbers do not round.  
 Sources: US Army 2003  
 USAF 2002a

**Table 4-5 Change in Land Areas  
Exposed to Indicated Sound Levels  
at Henry Post AAF - Proposed Action**

Sound Level (In L <sub>dn</sub> )	Acres of Land		Change
	Baseline	Proposed Action	
65 – 70	187.67	258.28	70.61
70 – 75	102.89	109.47	6.58
75 – 80	31.87	68.71	36.83
80 – 85	6.31	8.89	2.58
> 85	0.52	1.53	1.01
<b>Total &gt; 65</b>	<b>329.27</b>	<b>446.88</b>	<b>117.61</b>

Source: Wasmer and Maunsell 2002  
 L<sub>dn</sub> Day-Night Average Sound Level



**Figure 4-2 Henry Post AAF - Proposed Action Noise Contours  
Overlaid on Baseline Contours**

**Table 4-6 Changes in Population Exposed to Elevated Noise Levels at Henry Post AAF - Proposed Action**

<b>Sound Level (in L<sub>dn</sub>)</b>	<b>Population Exposed</b>		<b>Change</b>
	<b>Baseline</b>	<b>Proposed Action</b>	
65 – 70	150	220	70
70 – 75	88	91	3
75 – 80	27	57	30
80 – 85	8	11	3
> 85	1	2	1
<b>Total &gt; 65</b>	<b>274</b>	<b>381</b>	<b>107</b>

Source: USCB 2000

L<sub>dn</sub> Day-Night Average Sound Level

Under the proposed action, increased flight operations at the Henry Post AAF would increase the area of land exposed to 65 dBA or greater by 36 percent and the population exposed to 65 dBA or greater by 39 percent. Based on this exposure, it is estimated that 95 persons would be highly annoyed by the increased noise levels associated with this proposal (Finegold et al 1994). This represents an additional 27 persons over baseline conditions would be highly annoyed under the proposed action.

#### **4.2.1.3 No-Action Alternative**

Under the No-Action Alternative, no increased C-17 or KC-135R aircrew training would be implemented at either the Henry Post AAF or at Lawton/Fort Sill Regional Airport. The noise environment at each airfield would remain as described in Section 3.3.1.

#### **4.2.1.4 Cumulative Impacts**

Analysis of the potential impacts from other proposed actions affecting Altus AFB have been or are currently being analyzed in separate NEPA documents. These actions are not directly related to the proposed action evaluated in this EA, but are additional actions identified by the installation. Given the ROI for this noise analysis (i.e., Lawton/Fort Sill Regional Airport and Henry Post AAF), cumulative impacts from the interaction of the proposed action with other actions identified in Section 2.7 are unlikely to increase the noise levels of the areas.

#### **4.2.1.5 Mitigative Actions**

Mitigation measures to protect human health and the environment would not be required, since the implementation of the proposed action would not result in significant increase in noise at either the Lawton/Fort Sill Regional Airport or the Henry Post AAF.

#### **4.2.2 Air Quality**

Criteria to determine the significance of air quality impacts are based on federal, state, and local air pollution standards and regulations. Air quality impacts from a proposed activity or action would be considered significant if they: (a) increase ambient air pollution concentration above any NAAQS; (b) contribute to an existing violation of any NAAQS; (c) interfere with or delay timely attainment of NAAQS; or (d) impair visibility within any federally mandated PSD Class I area. The nearest PSD Class I area is the Wichita Mountains Wildlife Refuge, which is located approximately 20 miles northwest of the proposed sites.

As defined in 40 CFR 52.21, the proposed action would be considered a major source of emissions if total emissions of any pollutant subject to regulation under the CAA are greater than the major source threshold of 250 tpy for attainment and unclassified areas. Sources emitting less than the major source threshold for attainment and unclassified areas would not be considered major and would generally be considered regionally insignificant.

##### **4.2.2.1 Proposed Action**

Implementation of the Proposed Action would result in emissions from aircraft operations. Projected emissions from aircraft operations (VFR closed patterns, and VFR patterns plus approach and full stop) at Lawton/Fort Sill Regional Airport and Henry Post AAF were calculated using emission factors, flight profiles, and power settings for each aircraft from the available literature (Jagielski and O'Brien 1994; USEPA 1992; USAF 2002b; USAF 2002c; USAF 2002d; Gunnison 1995; Hewson 1996).

Estimated criteria pollutant emissions from aircraft operations under the proposed action, compared to baseline emissions at Lawton/Fort Sill Regional Airport and Henry Post AAF, are presented in Tables 4-7 and 4-8, respectively. Estimated emissions from the proposed airfields compared to the 1997 annual pollutant emissions for all stationary sources in AQCR 189 are presented in Tables 4-9 and 4-10.

**Table 4-7 Estimated Increase in Emissions from Aircraft Operations  
at Lawton/Fort Sill Regional Airport**

<b>Aircraft Operations</b>	<b>Annual Number</b>	<b>Annual Emissions (tons/year)</b>				
		<b>CO</b>	<b>VOC</b>	<b>NOx</b>	<b>SOx</b>	<b>PM<sub>10</sub></b>
VFR/Approach/Full-stop	<b>5,680</b>	29.5	8.4	4.8	0.3	0.4
VFR Patterns	<b>20,617</b>	44.2	2.6	150.2	4.9	8.0
<b>Total Emissions</b>		<b>73.7</b>	<b>11.0</b>	<b>155.0</b>	<b>5.2</b>	<b>8.5</b>
<b>Increase Over Baseline Emissions</b>		<b>6.9</b>	<b>0.9</b>	<b>89.9</b>	<b>2.7</b>	<b>4.9</b>
CO	Carbon monoxide		NO <sub>x</sub>	nitrogen oxides		
PM <sub>10</sub>	Less than 10 microns in diameter		SO <sub>x</sub>	sulfur oxides		
VOC	volatile organic compounds					

**Table 4-8 Estimated Increase in Emissions from Aircraft Operations at Henry Post AAF**

Aircraft Operations	Annual Number	Annual Emissions (tons/year)				
		CO	VOC	NOx	SOx	PM <sub>10</sub>
VFR/Approach/Full-stop	<b>1,692</b>	18.0	2.8	21.2	0.7	1.3
VFR Patterns	<b>6,355</b>	21.8	1.2	52.0	1.7	2.8
<b>Total Emissions</b>		<b>39.8</b>	<b>4.0</b>	<b>73.2</b>	<b>2.5</b>	<b>4.0</b>
<b>Increase Over Baseline Emissions</b>		<b>10.5</b>	<b>1.6</b>	<b>67.8</b>	<b>1.9</b>	<b>3.6</b>

CO Carbon monoxide  
 PM<sub>10</sub> Less than 10 microns in diameter  
 VOC volatile organic compounds

NO<sub>x</sub> nitrogen oxides  
 SO<sub>x</sub> sulfur oxides

**Table 4-9 Estimated Increase in Pollutant Emissions within AQCR 189 - Lawton/Fort Sill Regional Airport**

Emissions Source	Pollutant Emissions (tons/year)				
	CO	VOCs	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10</sub>
Total Estimated Emissions	73.7	11.0	155.0	5.2	8.5
1997 Regional (AQCR 189) Stationary Source Emissions*	<b>21,374**</b>	<b>2,560</b>	<b>14,906</b>	<b>1,185</b>	<b>353</b>
<b>Percent of Regional Emissions</b>	<b>0.34</b>	<b>0.43</b>	<b>1.04</b>	<b>0.44</b>	<b>2.41</b>

\* As reported in the 1997 ODEQ source emissions database (USAF 2002d). It does not include emissions from mobile sources.  
 \*\* Rangeland burning at Fort Sill in Comanche County accounted for 16,460 tpy.

CO Carbon monoxide  
 PM<sub>10</sub> Less than 10 microns in diameter  
 VOC volatile organic compounds

NO<sub>x</sub> nitrogen oxides  
 SO<sub>x</sub> sulfur oxides

**Table 4-10 Estimated Increase in Pollutant Emissions within AQCR 189 - Henry Post AAF**

Emissions Source	Pollutant Emissions (tons/year)				
	CO	VOCs	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10</sub>
Total Estimated Emissions	39.8	4.0	73.2	2.5	4.0
1997 Regional (AQCR 189) Stationary Source Emissions*	<b>21,374**</b>	<b>2,560</b>	<b>14,906</b>	<b>1,185</b>	<b>353</b>
<b>Percent of Regional Emissions</b>	<b>0.19</b>	<b>0.16</b>	<b>0.49</b>	<b>0.21</b>	<b>1.13</b>

\* As reported in the 1997 ODEQ source emissions database (USAF 2002d). It does not include emissions from mobile sources.  
 \*\* Rangeland burning at Fort Sill in Comanche County accounted for 16,460 tpy.

CO Carbon monoxide  
 PM<sub>10</sub> Less than 10 microns in diameter  
 VOC volatile organic compounds

NO<sub>x</sub> nitrogen oxides  
 SO<sub>x</sub> sulfur oxides

As shown in Tables 4-7 and 4-8, aircraft operations at the proposed sites would generate emissions for CO, VOC, NO<sub>x</sub>, SO<sub>x</sub>, and PM<sub>10</sub> below the PSD threshold of 250 tons per year. When compared to the 1997 annual pollutant emissions for all stationary sources in AQCR 189 (Tables 4-9 and 4-10), the estimated emissions from proposed aircraft operations would account for less than 2.5 percent of the total regional (AQCR 189) stationary source emissions for each pollutant. Therefore, emissions from the proposed action would not result in any long-term impacts on the air quality of Comanche County and would not affect visibility at the Wichita Mountains Wild Class I area.

#### **4.2.2.2 No-Action Alternative**

Under the no-action alternative, the baseline conditions described in Section 3.3.2 would not change. Therefore, no emissions increase or decrease from the aircraft operations would result from this alternative.

#### **4.2.2.3 Cumulative Impacts**

Analysis of the potential impacts from other proposed actions affecting Altus AFB have been or are currently being analyzed in separate NEPA documents. These actions are not directly related to the proposed action evaluated in this EA, but are additional actions identified by the installation.

Implementation of the proposed action would not be expected to have any long-term impacts to regional air quality. The AQCR 189 baseline emissions include only permitted, stationary sources and do not include mobile sources or other non-permitted sources. Therefore, the actual percent increase from the baseline due to cumulative emissions would be less than that presented in Tables 4-9 and 4-10 if mobile source emissions were considered in the baseline. As a result, cumulative impacts from the interaction of the proposed action with other actions identified in Section 2.7 are unlikely to contribute to degradation of air quality in the region.

#### **4.2.2.4 Mitigative Actions**

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed action would not result in any long-term impacts to regional air quality.

### **4.2.3 Biological Resources**

Potential impacts to biological resources are determined by analyzing the proposed action and alternatives within the context of existing conditions for regional biota and ecosystems. An impact to biological resources would be considered if the proposed action would have an adverse impact on threatened or endangered species, substantially diminish habitat for a plant or animal species, substantially diminish a regionally or locally important plant or animal species, interfere substantially with wildlife movement or reproductive behavior, or result in a substantial infusion of exotic plant or animal species.

#### **4.2.3.1 Proposed Action**

##### **4.2.3.1.1 Wildlife**

The proposed action would be implemented on two active airfields within an urban environment. All of the routes currently used by aircraft accessing Lawton/Fort Sill Regional Airport or Henry Post AAF would continue without change under the proposed action. Any increases in flight operations would not pose a significant impact on the existence or regional movement of any of the species discussed in Section 3.3.3. Additionally, the proposed action would not significantly degrade critical habitat of any of the species that have the potential to occur in the area.

##### **4.2.3.1.2 Threatened and Endangered Species**

No threatened and endangered species are known on or near the two airfields; therefore, there would be no impact from the proposed action. In addition, the proposed action would have no impact on the continued existence of the federal and state listed endangered and threatened species that occur in Comanche County. Letters requesting federal and state lists of threatened and endangered species have been forwarded and responses are pending. Copies of this correspondence will be enclosed in Appendix B.

#### **4.2.3.2 No-Action Alternative**

Under the no-action alternative there would be no increase in aircraft operations at either the Lawton/Fort Sill Regional Airport or the Henry Post AAF. Therefore, no impacts to biological resources would occur under this alternative.

#### **4.2.3.3 Cumulative Impacts**

Cumulative impacts to biological resources would not occur under the ongoing actions in the vicinity of either the Lawton/Fort Sill Regional Airport or the Henry Post AAF.

#### **4.2.3.4 Mitigative Actions**

Because no construction or demolition of activities would occur and all flight operations would use existing routes, impact to biological resources inclusive of endangered and threatened species would not occur. Therefore, no mitigation measures beyond best management construction practices are required.

#### **4.2.4 Environmental Justice**

An analysis was conducted to determine whether there would be disproportionately high and adverse impacts on minority or low-income populations as a result of the proposed action or alternatives. Census tract data generated in 2000 by the USCB was used to project an estimated minority and low-income population distribution in the areas surrounding the airfields. The census tracts defined for the area surrounding Lawton/Fort Sill Regional Airport and Henry Post AAF are not uniform in the amount of area covered or in the density of the population. Although this was the most consistent

and conservative means to evaluate the potential affects of the proposed action and alternatives on minority and low-income populations, the results of this analysis are only a rough and conservative estimate.

#### **4.2.4.1 Proposed Action**

##### **4.2.4.1.1 Lawton/Fort Sill Regional Airport**

As defined by the 2000 census data generated by the USCB, 35 percent of Comanche County is comprised of minority populations and almost 17 percent live below poverty levels. Using the same methodology for estimating the distribution of minority and low-income populations as discussed in Section 4.3.4 above, it is estimated that of the individuals currently exposed to 65 dBA or greater around the Lawton/Fort Sill Regional Airport, 50 percent would be minorities and 37 percent would be living below poverty level.

As discussed in Section 4.3.1.2 the proposed action would increase the number of people exposed to 65 dBA or greater noise levels in the area surrounding the Lawton/Fort Sill Regional Airport by 23 percent. Of the estimated 214 additional people that would be affected by the increase flight operations and associated noise levels, less than 20 percent would be of minority descent and approximately 17 percent would be of low-income (Table 4-11). Both percentages would be below those defined for Comanche County, Oklahoma, and therefore, would not represent a disproportionate high number of minorities or low-income families impacted by the increase in population exposed to 65 dBA noise levels or greater at Lawton/Fort Sill Regional Airport.

##### **4.2.4.1.2 Henry Post AAF**

As discussed in Section 4.3.1.2 the proposed action would increase the number of people exposed to 65 dBA or greater noise levels at the Henry Post AAF by 39 percent. Of the estimated 107 additional people that would be affected by the increase flight operations and associated noise levels, approximately 37 percent would be of minority descent and less than 62 percent would be of low-income (Table 4-12). Both percentages would be higher than those defined for Comanche County, Oklahoma, at 35 and 16 percent, respectively. However, the minority population percentage is only slightly higher than the projected distribution of minorities for the county. Additionally, the distribution of low-income families is not likely to be evenly distributed across the census tract as discussed in Section 4.3.4; therefore, the projected increase in low-income individuals exposed to 65 dBA or greater noise levels would not be expected to be as high as 62 percent (Table 4-12). Therefore, the proposed action at Henry Post AAF would not represent a disproportionately high number of minorities or low-income families impacted by the increase in population exposed to 65 dBA noise levels or greater.

#### **4.2.4.2 No-Action Alternative**

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.3.4.

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**Table 4-11 Comparison of Baseline and Proposed Action Noise Scenarios for Lawton/Fort Sill Regional Airport (Census 2000)**

Noise Level (L <sub>dn</sub> )	Baseline Noise Contours				Proposed Action Noise Contours				% Change from Baseline Noise			
	Affected Land Area (sq. mi.)	Total Population	Minority Population	Population Below Poverty	Affected Land Area (sq. mi.)	Total Population	Minority Population	Population Below Poverty	Affected Land Area	Total Population	Minority Population	Population Below Poverty
65 - 70	1.657	820	400	298	1.751	1008	476	346	5.64	22.93	19.00	16.11
70 - 75	0.724	100	61	47	0.749	125	76	58	3.48	25.00	24.59	23.40
75 - 80	0.327	3	1	1	0.354	4	2	2	8.01	33.33	100.00	100.00
> 80	0.041	0	0	0	0.048	0	0	0	17.784	0	0	0
<b>Total</b>	<b>2.749</b>	<b>923</b>	<b>462</b>	<b>346</b>	<b>2.901</b>	<b>1137</b>	<b>554</b>	<b>406</b>	<b>5.53</b>	<b>23.19</b>	<b>19.91</b>	<b>17.34</b>

L<sub>dn</sub> Day-Night Average Sound Level  
sq. mi Square mile

**Table 4-12 Comparison of Baseline and Proposed Action Noise Scenarios for Fort Sill (Census 2000)**

Noise Level (L <sub>dn</sub> )	Baseline Noise Contours				Proposed Action Noise Contours				% Change from Baseline Noise			
	Affected Land Area (sq. mi.)	Total Population	Minority Population	Population Below Poverty	Affected Land Area (sq. mi.)	Total Population	Minority Population	Population Below Poverty	Affected Land Area	Total Population	Minority Population	Population Below Poverty
65 - 70	0.286	150	71	8	0.392	220	102	15	36.89	46.67	43.66	87.50
70 - 75	0.169	88	43	4	0.174	91	44	4	2.89	3.41	2.33	0.00
75 - 80	0.052	27	13	1	0.110	57	28	2	109.91	111.11	115.38	100.00
80 - 85	0.015	8	4	0	0.021	11	5	0	40.97	37.50	25.00	0.00
> 85	0.001	1	0	0	0.004	2	1	0	207.22	100.00	0.00	0.00
<b>Total</b>	<b>0.524</b>	<b>274</b>	<b>131</b>	<b>13</b>	<b>0.701</b>	<b>381</b>	<b>180</b>	<b>21</b>	<b>33.69</b>	<b>39.05</b>	<b>37.40</b>	<b>61.54</b>

L<sub>dn</sub> Day-Night Average Sound Level  
sq. mi Square mile

**4.2.4.3 Cumulative Impacts**

There are no other actions identified for the Lawton/Fort Sill Regional Airport and Henry Post AAF that would potentially present cumulative impacts to Environmental Justice. Therefore, no cumulative effects would be anticipated as a result of the proposed action.

**4.2.4.4 Mitigative Actions**

Mitigation measures for environmental justice would not be required for the proposed or alternative actions.

**4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

NEPA also requires that environmental analysis include identification of "... any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects of that use on consumption or destruction of a resource that could not be replaced in a reasonable period of time.

There are no construction activities as part of the proposed action. Therefore, there would be no consumption of building materials. As a result, there would be no irreversible and irretrievable commitment of resources under the proposed or alternative actions.

## **CHAPTER 5**

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## **CHAPTER 6**

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The following individuals were consulted during the preparation of this EA:

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## **6.2 STATE AGENCIES**

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### **Oklahoma Department of Wildlife Conservation**

Heuer, Thomas

## **6.3 LOCAL AGENCIES**

### **Office of the Mayor, City of Lawton, Oklahoma**

Powell, Cecil E.

## **CHAPTER 7**

### **REFERENCES**

- American National Standards Institute (ANSI). 1980. *Sound Level Descriptors for Determination of Compatible Land Use*. ANSI S3.23-1980.
- ANSI. 1988. *Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1*. ANSI S12.9-1988.
- Federal Interagency Committee on Noise (FICON). 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*.
- Federal Interagency Committee on Urban Noise (FICUN). 1980. *Guidelines for Considering Noise in Land Use Planning and Control*. Washington, D.C. NIIS PB83-184838.
- Finegold, L.S.; Harris, C.S.; von Glerke, H.E. *Community Annoyance And Sleep Disturbance: Updated Criteria For Assessing The Impacts Of General Transportation Noise On People*. Noise Control Engineering Journal, Jan-Feb 1994.
- Gunnison, B. 1995. *The Encyclopedia of Modern Warplanes*. Barnes & Noble Books, London, England.
- Harrison, R.T. 1973. *Forest Background Sound*. Report to Record, ED&T 2428, USDA Forest Service, Technology and Development Center, San Dimas, California. In: Harrison, R.T., L.A. Hartmann, and W.J. Makel. 1990. *Annoyance from Aircraft Overflights in Wilderness*. NOISE-CON 90, University of Texas. Austin, Texas. October.
- Hewson, R. 1996. *The Vital Guide to Commercial Aircraft and Airliners*. Airlife Publishing, Ltd., Shrewsbury, England.
- Jagielski, K. and O'Brien, J. 1994. *Calculations Methods for Criteria Air Pollution Emission Inventories*. USAF, Armstrong Laboratory, AL/OE-TR-1994-0049. Brooks AFB.
- Lawton-Fort Sill Regional Airport. 2003. *Airport Traffic Record* (FAA Form 7230-1).
- Moulton, Carey L. 1990. *Air Force Procedure For Predicting Aircraft Noise Around Airbases: Noise Exposure Model (NOISEMAP) User's Manual*. Harry G. Armstrong

- Aerospace Medical Research Laboratory, Human Systems Division, Air Force Systems Command, Wright-Patterson AFB, OH. AAMRL-TR-90-011. February.
- Occupational Safety and Health Administration (OSHA). 1983. *Occupational Noise Exposure Standard*. Code of Federal Regulations (CFR), Title 29, Part 1910, sec. 1910.95 (29 CFR § 1910.95).
- USAF. 1993. United States Air Force, *Environmental Assessment, New Drop Zone, Altus AFB, Oklahoma*, October 1993.
- USAF. 1994. United States Air Force, Air Force Instruction 32-7040, *Air Quality Compliance*, May 9, 1994.
- USAF. 2002a. *Description of the Proposed Action and Alternatives, C-17 Training at Lawton and Fort Sill*.
- USAF. 2002b. *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations*. Robert J. O'Brien and Mark D. Wade, Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis Directorate, Environmental Analysis Division, Brooks AFB, TX, IERA-RS-BR-SR-2001-0010. January.
- USAF. 2002c. *Aircraft/Auxiliary Power Units/Aerospace Ground Equipment Emission Factors*. Mark D. Wade, Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis Directorate, Environmental Analysis Division, Brooks AFB, TX, IERA-RS-BR-SR-2003-0002. October.
- USAF. 2002d. *Final Environmental Impact Statement Proposed Airfield Repairs, Improvements, and Adjustments to Aircrew Training for Altus Air Force Base, Oklahoma*. 97<sup>th</sup> Air Mobility Wing, Air Education and Training Command. May.
- USAF. 2003a. *General Aviation Information*. General Information at Fly Lawton. Website: [http://flylawton.com/gen\\_info.htm](http://flylawton.com/gen_info.htm). Accessed on 19 June 2003.
- USAF. 2003b. *OMEGA108 NOISEFILE Data Base*. Harry G. Armstrong Aerospace Medical Research Laboratory (AAMRL), Wright Patterson Air Force Base, Ohio. Accessed June 2003.
- US Army. 1996. *Draft Environmental Impact Statement for the Master Plan US Army Field Artillery Center and Fort Sill, Oklahoma*. US Army Corps of Engineers, Tulsa District. February.
- US Army. 2002a. *Environmental Assessment Construction of Modified Record Fire Range*. Department of the Army, Headquarters, US Army Training and Doctrine Command. January.

- US Army. 2002b. *Henry Post Army Airfield*. Global Security Organization. Website: <http://www.globalsecurity.org/military/facility/post.htm>. Last modified 4 June 2002. Accessed 9 November 2002.
- US Army. 2002c. *Fort Sill*. Global Security Organization. Website: <http://globalsecurity.org/military/facility/fort-sill.htm>. Last modified 4 June 2002. Accessed 9 November 2002.
- US Army. 2003. *Monthly Traffic Records*. Department of the Army Form 3479-6-R.
- US Census Bureau. 2000. U. S. Bureau of the Census. Population Tracts. 2000 Census.
- US Census Bureau. 2002. *Comanche County Quick Facts from the US Census Bureau*. US Census Bureau. <http://quickfacts.census.gov/qfd/states/40/40031.html>. Accessed 12 June 2003.
- USEPA. 1992. *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*. EPA-450/4-81-026d (Revised).
- USEPA. 1974. *Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety*. EPA Report 550/9-74-004.
- Wasmer, F. and Mausell, F. 2002. *NMPlot Computer Program*. Wasmer Consulting.

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